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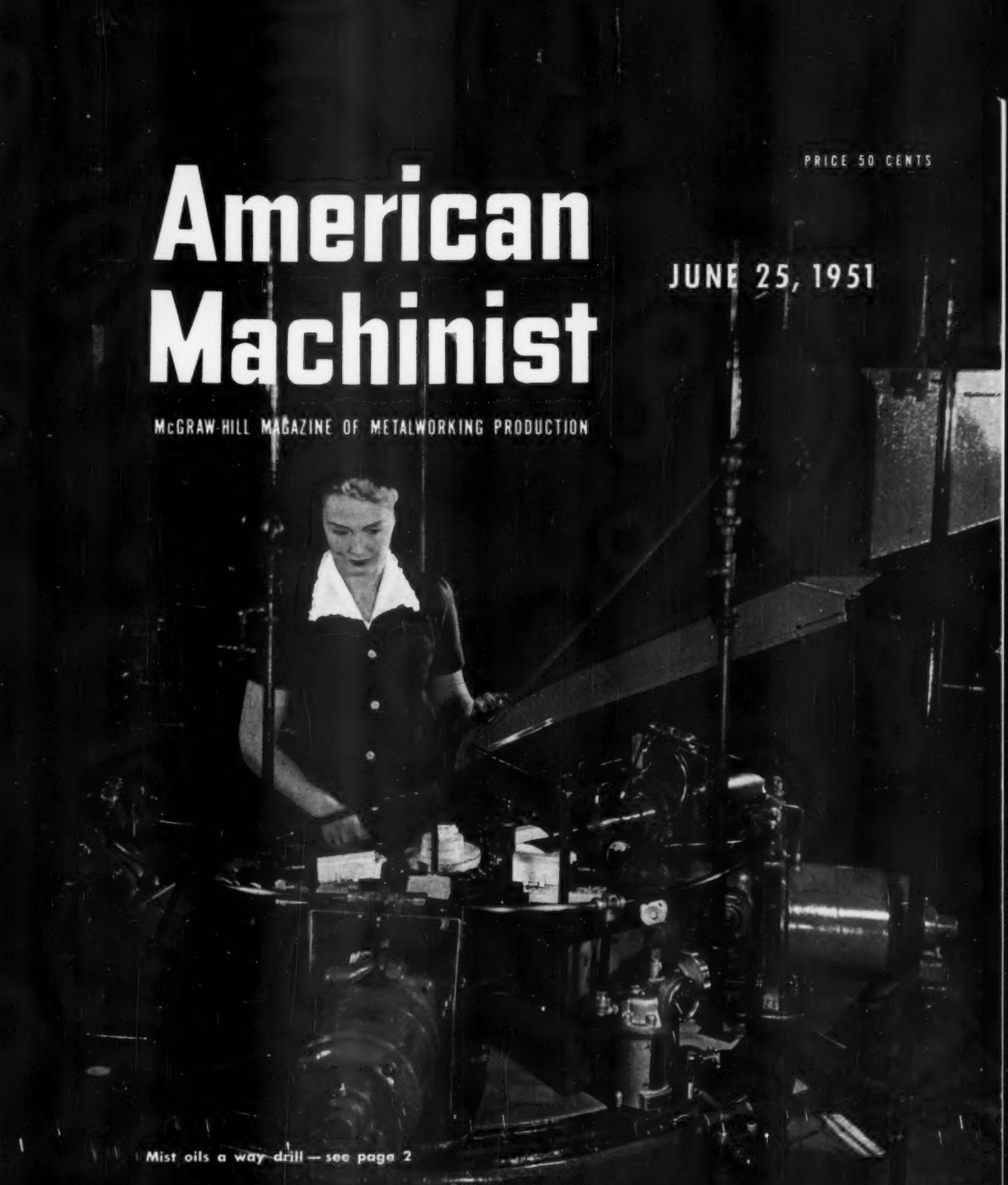
American Machinist

JUNE 25, 1951

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Mist oils a way-drill — see page 2

Single-Spindle Automatics — A SPECIAL REPORT

Deburring Aircraft Sheet

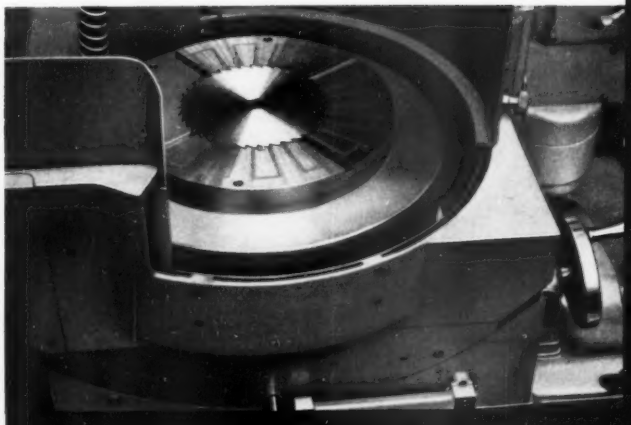
MORE WORK with LESS EFFORT

. . . that's today's trend in production, too— thanks to the time-saving, effort-saving features of Heald grinders and Bore-Matics

Today's high-speed production machines have multiplied manpower many fold. Yet, in so doing, they have made the job many times easier, too.

On Heald precision grinders and Bore-Matics, for example, fully automatic cycles, convenient control grouping and simplified loading enable an operator to turn out more parts per hour — with greater accuracy and precision, with less effort and fatigue. And Heald's improved guarding provides extra cleanliness and safety for every operation.

Remember — when it comes to precision finishing, it pays to come to Heald.



Circular Saw Blades Ground

190% FASTER on a new Heald Model 261 Rotary Surface Grinder

In this case HERE'S WHY

1. **AUTOMATIC FEED AND RETRACTION** — the surface grinding operation is performed automatically, with maximum speed and precision, simply by pushing the starting button

2. **PRECISE TAPER CONTROL** — the chuck is swiveled to provide a .005" taper toward the center of the blade.

3. **SIMPLIFIED LOADING** — the saw blade is simply placed over a center locating plug in the 12" magnetic gap chuck, with a drive pin between the teeth as an extra safeguard against slippage under heavy cuts.

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American Machinist

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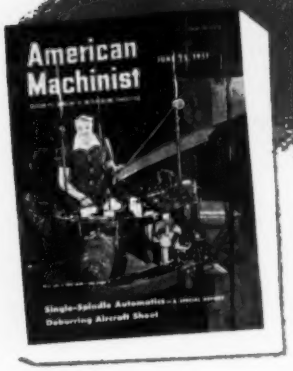
Chips and Quips



Fog . . . Our cover Kodachrome shows a Kingsbury way drill at Stewart-Warner Corporation, Chicago, that has been lubricated for almost a year at a rate of an ounce of SAE 20 oil each 8-hr shift. The drill is form-drilling angle openings in lubrication fittings one or two shifts a day. It's a case of the doctor taking his own medicine and liking it, because the lubricator is the "Oil-Mist" unit announced recently by S-W and this is one of the first test installations. Forgetting what the sales department would gladly say, the shop men like it. Reason: One fill of the reservoir a week and no further attention. No excess grease to catch chips or gummy deposit to foul motor or cause machine eccentricity and scrap. Cam rollers last 3 or 4 times as long, rocker-arm bushings, drive rollers, roller bearings and wormgear are lasting several times as long. Now foreman and tool setter say they're *not* in a fog because lubricated parts *are*—a fog of oil.

Deburring . . . What we'd like to call "burring," but aircraft plants insist is "deburring" is a time-consuming operation. Small parts can be deburred mechanically by blast or tumbling, but sheet forms don't yield to such treatment. So, some months ago, we queried aircraft plants on best current methods of doing the job. The choicest ones are pictured in this issue.

Mechanized Railroad Shop . . . Boiler flues are a problem. This issue carries a picture-caption story on cleaning, inspection, sawing, welding, and swedging flues automatically. It cracks a tough nut where the steam locomotive is king.

Auto Turrets . . . Associate Editor "Mike" Rowan, continuing his illuminating series of Special Reports on automatic lathes, this time takes 16 pages to detail automatics with indexing turrets that can be applied to chucking work. Both horizontal and vertical machines are covered—and all but one are single-spindle units. Operating principles, tooling, and numerous features designed to simplify and speed setup are described.

Induction . . . Continuing our periodic survey of induction heating, C. H. Yetman describes such soldering of non-ferrous metals to close tolerances. He explains some typical fixtures too . . . Another assembly operation, this time at Research Welding & Engrg Co. on the Pacific Coast, is the forming and welding of heavy spheres.

Tooling . . . In addition to articles separately mentioned, we have several features on tooling. One is the conversion of an old Potter & Johnston chucker to the milling of segments. Finish is improved and output increased by mounting a fixture for the rings on the slide and applying a drive to cutter spindles . . . P. R. Emzler, supt. at Micro Switch Div., uses his own company's product in a progressive die. Search fingers in the die actuate Micro switches if any scrap stays in the die or the part is not ejected.

On Leash . . . That swivel hook on the end of a dog leash can cause real manufacturing trouble. At Allied Tool, they've mounted a spinning head on a Nilson 4-slide wire-forming machine to head the end of the wire over a washer automatically while the wire is formed into a hook. Otherwise a bigger machine would be required.

Coming . . . The third Special Report of our series of four on threading will feature *AM* for July 9. With it will be seven short articles on a variety of subjects. There'll be a story on induction die casting, another on electrical circuits stamped from thin-gage metal and "glued" to plastic, still another on what causes safety. Another management short deals with waste of manpower. For tool men, there's a story on the tool crib at John Volkert, another on a portable radial drill, and a group of Shop Shots. The cover pictures the gaging of bores on Jeep cylinder blocks.

INDUCTION HEATER . . . Chas. H. Yetman, development engineer, of Heatronic Engineering, Utica, N. Y., is the originator of many induction-heating applications including dimensional soldering of non-ferrous metals as well as the soldering of brass and steel to aluminum. See this issue.

Prior to World War II he was associated with the International Harvester and Relay Motors in the manufacture of motor trucks, concerned chiefly with development and engineering work. During the war he served with the engineering department of Savage Arms in manufacture of the famous "Tommy" gun. Here, the problem of lengthening "barrel-life" of automatic guns introduced an application of induction heat. He has since devoted his development experience to induction heating. Realizing the need for consulting engineers in this field, he formed Heatronic Engineering to make available to manufacturers with induction problems an engineering service. He is a member of ASTE.

IF
YOUR PROBLEM
IS
BEVEL GEAR OR CURVIC COUPLING DESIGN
To help you . . .
THE DESIGN ENGINEER should provide us with preliminary layouts or prints of proposed bevel gear designs . . . type of drive, horsepower and speed . . . type of loading (constant, intermittent or shock) . . . type of material . . . driving member and direction of rotation.
THE PRODUCTION ENGINEER should furnish blue prints, material specifications, manufacturing tolerances . . . quantity of gears to be produced . . . number of working hours available for production.
Every day highly skilled engineers within our organization provide the answers to these problems. Backed by the company's 85 years' experience in this field, our complete engineering service is at your disposal, without obligation, to study any bevel gear or Curvic coupling design problem you may have. We will be glad to make our recommendations as to the best design, the proper equipment and the most advantageous methods for reducing production time and costs.
STRAIGHT BEVEL
SPIRAL BEVEL
ZEROL BEVEL
HYPOID GEARS
BUILDERS OF BEVEL GEAR MACHINERY
GLEASON
FOR OVER EIGHTY-FIVE YEARS
GLEASON WORKS
1000 UNIVERSITY AVENUE · ROCHESTER 3, NEW YORK

Improved

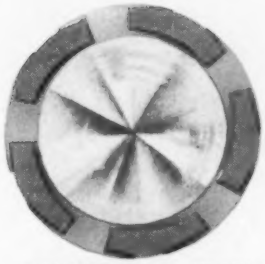
...improved

Grinding the anti-friction bearing diameter of a sleeve gear. This machine is a CINCINNATI FILMATIC 10" x 36" Plain Hydraulic Grinder.

Performance

operating convenience

Offered by Cincinnati Filmatic 10" Plain Hydraulic Grinding Machines



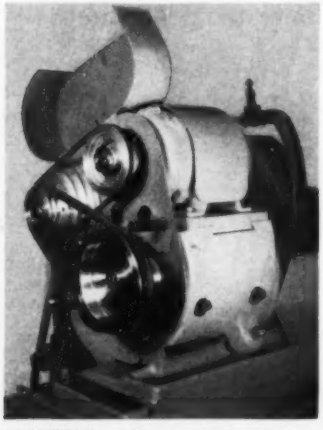
GRINDING WHEEL SPINDLE BEARINGS — FILMATIC bearing principle is illustrated above. Multiple segments are free to rock slightly, admitting wedge-shaped oil films; self-adjusting for all grinding conditions.

Performance tells the story . . . more convincingly than ever before by the improved CINCINNATI FILMATIC 10" and 14"-L Plain Hydraulic Grinding Machines.

They have a new headstock, powered by an AC motor with built-in magnetic brake; all V-belt drive; eccentric counter-shaft for belt tension adjustment and changing the belt on the four-step pulley . . . bed is 2" lower, making it easier to load and unload the work . . . grinding wheel collets take 12" hole wheels, for continued usefulness on smaller machines after wear retards efficient grinding.

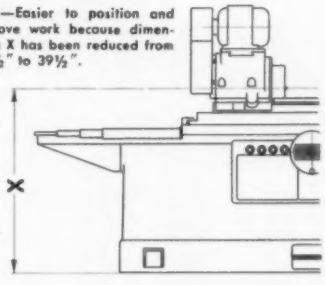
Time-proved features that have been retained include FILMATIC grinding wheel spindle bearings; they require no more than token attention and last for years without adjustment. Table ways are automatically pressure lubricated with filtered oil from an individual system; protected by telescoping guards. Control elements are at the front of the machine, grouped for convenient, easy operation. Other features and complete specifications are listed in a new catalog No. G-603. We shall be glad to send you a copy.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

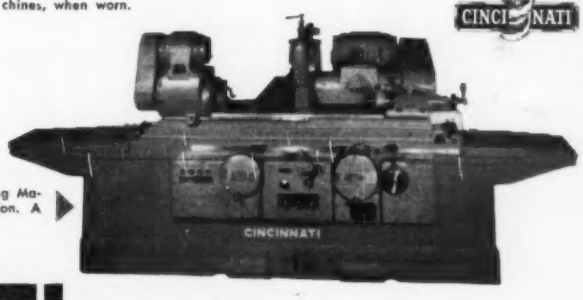


HEADSTOCK — New headstock, all V-belt drive, powered by AC motor, convenient device for shifting belt.

WHEEL — 12" hole wheel offers extended use on smaller machines, when worn.



BED—Easier to position and remove work because dimension X has been reduced from 41½" to 39½".



CINCINNATI FILMATIC 10" x 48" Plain Hydraulic Grinding Machine. Catalog No. G-603 contains complete information. A brief description may be found in Sweet's File.

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

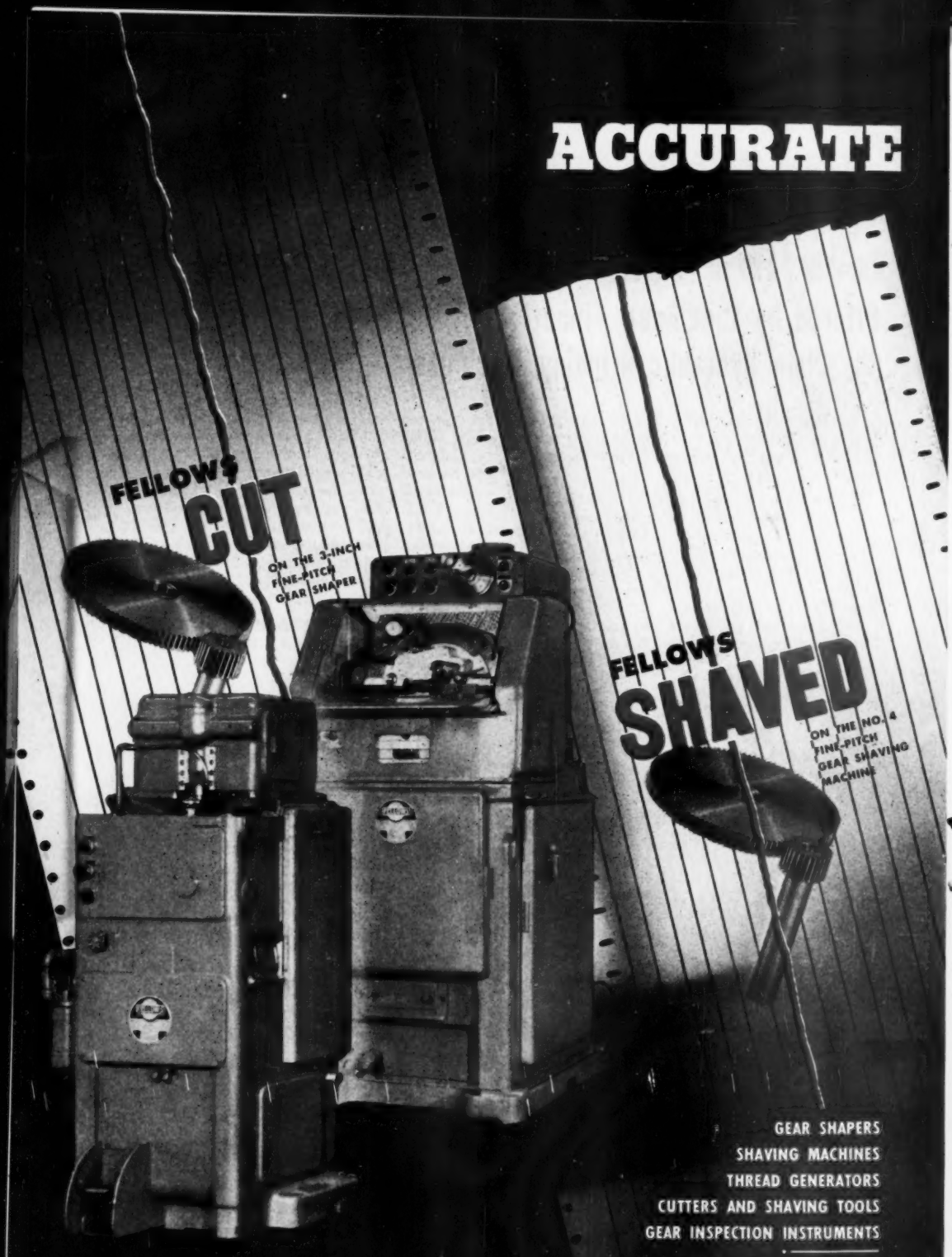
ACCURATE

FELLOWS CUT

ON THE 3-INCH FINE-PITCH GEAR SHAPER

FELLOWS SHAVED

ON THE NO. 4 FINE-PITCH GEAR SHAVING MACHINE



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

GEAR OPERATIONS

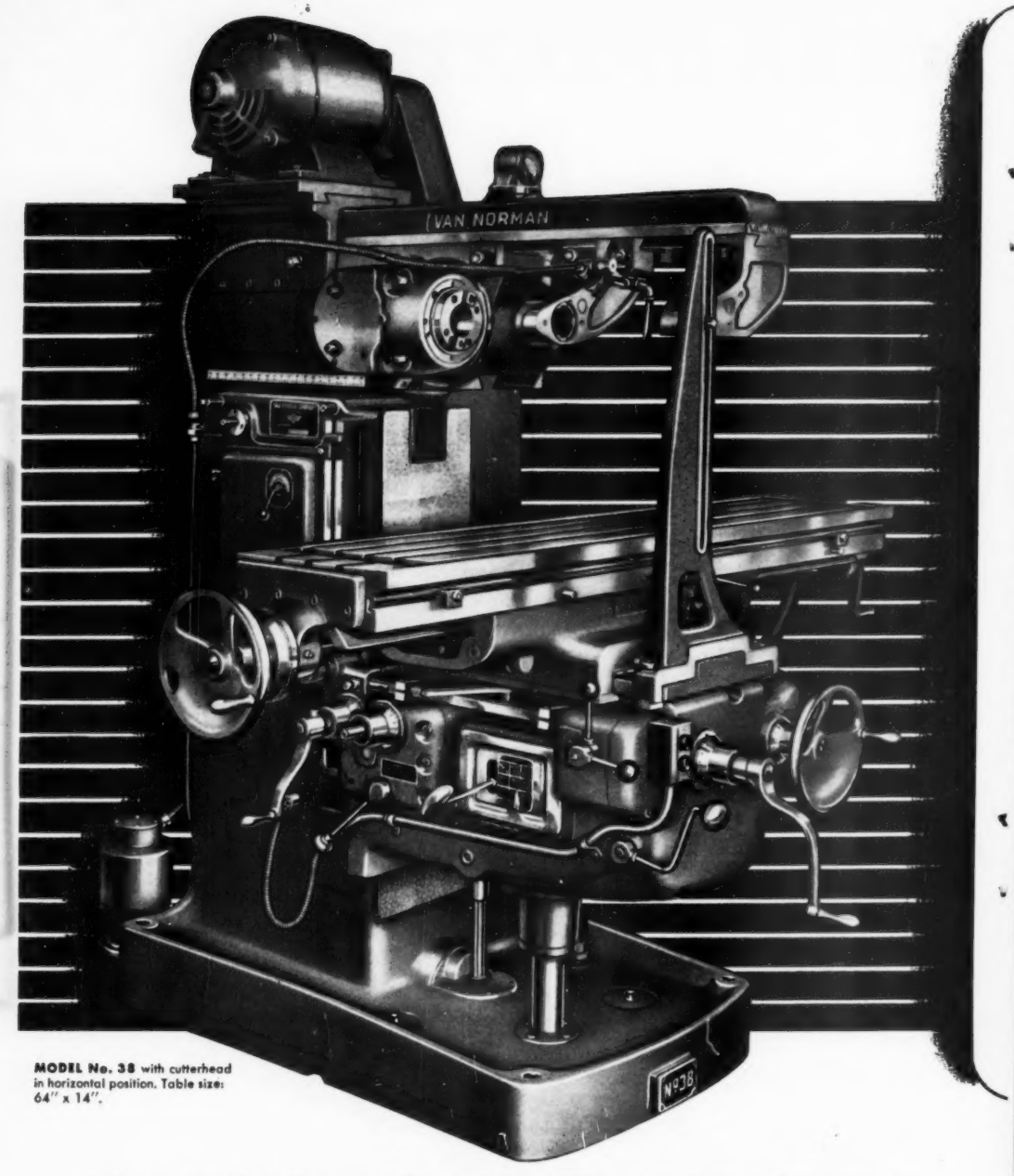
...in Balance

Ability to Mass-Produce Fine-Pitch Gears to Tolerances in Low "Tenths" Spotlights The Fellows Method.

The balanced combination of the Fellows "Fine-Pitch" Gear Shaper and the No. 4 Gear Shaving Machine, aided by the superlative accuracy of Fellows cutters and shaving tools, assures unbelievably close limits. The inspection charts opposite are reproduced from production-run performance—where specifications demanded holding these 48-pitch gears to 0.0003" after shaving. ''' The routine super-precision is accomplished by setting up for 3 cuts on the Gear Shaper, and 6 passes on the companion Fellows Shaving Machine. Notice, please, that with accurately-machined blanks it was possible to hold a maximum error after cutting to 0.0005"—and not over 0.0002" after shaving. ''' If you have fine-pitch gears to produce, Fellows can help you hold to any tolerances that contemplated service demands. Write, wire or phone the nearest Fellows office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 616 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1



MODEL No. 38 with cutterhead in horizontal position. Table size: 64" x 14".

There's a Van Norman Ram Type Miller for Every Application

You'll Get More Production Hours

with the

VAN NORMAN

No. 38 Ram Type Miller

Operating records in many plants prove that the Van Norman No. 38 Ram Type Miller increases milling production, cuts down idle machine time, and lowers over-all milling costs.

The adjustable cutterhead permits you to perform horizontal, angular or vertical milling on *one* machine. There is no waiting for single purpose machines because practically all operations can be on the ram type miller. All the operator need do is position the cutterhead in the desired position and he is ready to start milling. In addition, work set-ups are reduced to a minimum and the operator gets out more work.

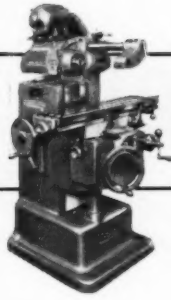
Investigate the Van Norman No. 38 Ram Type Miller for the toolroom, laboratory, pattern and die work, or production milling. Write for complete information.

Compare These Operating Features

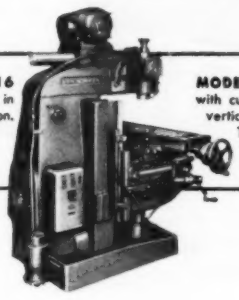
- **WIDE RANGE OF USE**... Adjustable cutterhead has 90° adjustment.
- **SIMPLICITY OF CONTROL**... All power feed controls are directional — operate in direction of desired table, saddle and knee movement.
- **INCREASED RANGE**... Ram adjustment, in and out over column, provides added work range and capacity.
- **RIGIDITY AND POWER**... Heavy-duty, hardened alloy steel gears with multi-splined shafts; massive streamlined cutterhead and ram; rugged column and knee assembly.
- **LONG LIFE**... Automatic lubrication; anti-friction bearings; larger diameter feed screws.
- **SPEED**... Spindle speeds up to 2000 R.P.M., powered by a 10 h.p. motor, permits every type of milling with all types of cutting tools.

VAN NORMAN COMPANY

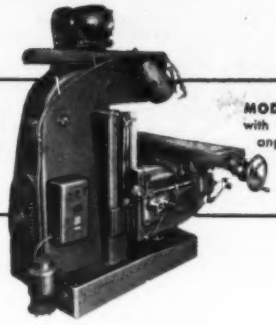
SPRINGFIELD 7, MASSACHUSETTS



MODEL No. 16 with cutterhead in horizontal position. Table size: 37" x 9½".

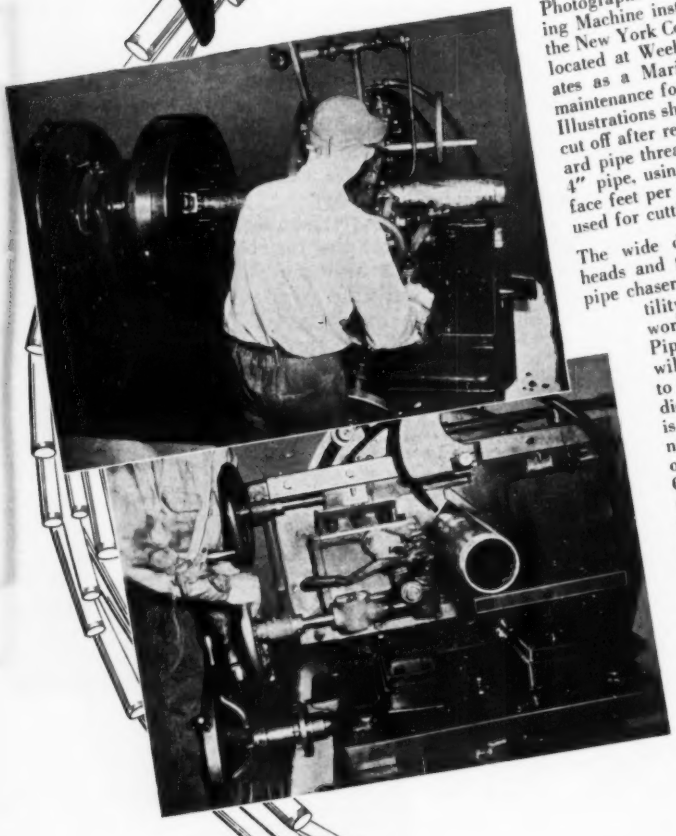


MODEL No. 22L with cutterhead in vertical position. Table size: 45" x 10".



MODEL No. 26 with cutterhead in angular position. Table size: 58" x 13".

Versatility



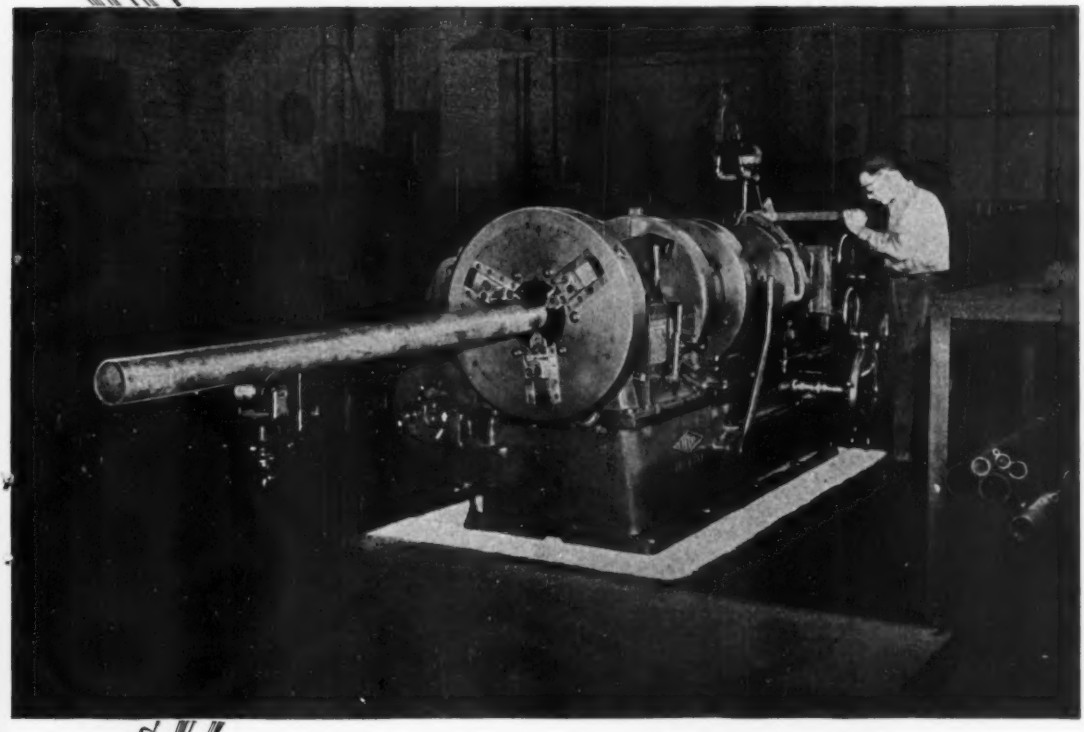
Photographs show a Landis Pipe Threading Machine installation in a Job Shop of the New York Central Railroad. This shop, located at Weehawken, New Jersey, operates as a Marine Repair Shop handling maintenance for tugs, barges, lighters, etc. Illustrations show wrought iron pipe being cut off after reaming and threading. Standard pipe threads are cut 1½" long on the 4" pipe, using a cutting speed of 25 surface feet per minute. This machine is also used for cutting boiler tubes to length.

The wide diametrical range of the die heads and the use of patented tangential pipe chasers gives these machines a versatility invaluable in maintenance work. For example, the 6" Landis Pipe Threading Machine illustrated will thread all pipe sizes from 1" to 6", inclusive. Adjustment of the die head from one size to another is simple and quick. Chasers need not be changed except for threads of a different pitch, form, or taper. Chasers are interchangeable and need only be replaced singly as needed. Tangential cutting action reduces wear, and chasers can be reground to use over 80% of their length. Thus, these machines feature—wide capacity; minimum set-up; longer running time; low tool cost, replacement, and inventory—important cost saving features for maintenance shops. For specifications and further information, write for Bulletin C-61.

LANDIS

WORLD'S LARGEST

SAVES TIME AND MONEY IN MAINTENANCE SHOPS



Machine COMPANY WAYNESBORO PENNA., U.S.A.

EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

HOW OPERATOR CONVENIENCE PAYS OFF

on new LANDIS TOOL 10"-14" plain grinders

- **Centralized controls save set-up time**
- **Arms-length controls less tiring**
- **Grouped for normal operating sequence**
- **Less operator skill required**

LANDIS TOOL 14" x 48" Type CH
Plain Grinder. Catalog B50

135

LANDIS TOOL
Precision Grinders

Send us your work prints for study and let our production estimates show how you can increase your cylindrical grinding out-put.

IN HIGH GRINDING PRODUCTION

LANDIS TOOL COMPANY / WAYNESBORO, PENNA. / U.S.A.

MAJOR REPAIRS ON DIESEL ENGINES CONVERTED TO ROUTINE MACHINING OPERATIONS . . . . .

G. & L. FLOOR TYPE MACHINE WITH ROTARY TABLE EASILY GEARS RAILROAD SHOPS TO ALL URGENT AND UNUSUAL REPAIR DEMANDS

Boring cylinder liner holes and main bearings; milling distorted crankcase sections; turning cylinder heads; milling and boring camshaft bearing seats are but a few of the major Diesel repair operations easily performed on the versatile G. & L. Floor Type Machine with Rotary Table.

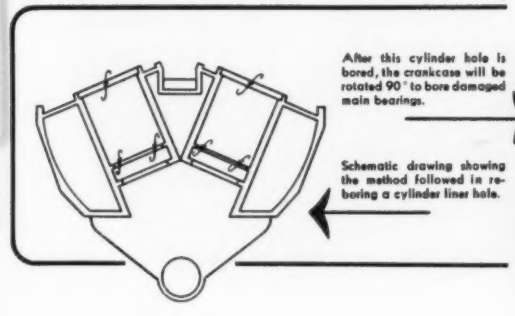
This advanced machining practice followed in progressive railroad shops ends the need to return major Diesel engine components to the original manufacturer for repairs. As a result, *out-of-service* time is reduced to a minimum.

Multiple Operations Performed in Single Work Setup

Cylinder liner holes distorted in use are quickly realigned and rebored on this G. & L. machine. Once the crankcase is placed on the rotary table, various machine movements accurately and rapidly position the work in relation to the cutting tool and machine spindle. No time is lost in cut and try operations. Scales and verniers are depended upon to locate bore center distances. Completing the required boring operations, the rotary table is then indexed 90° to bore the main bearings.

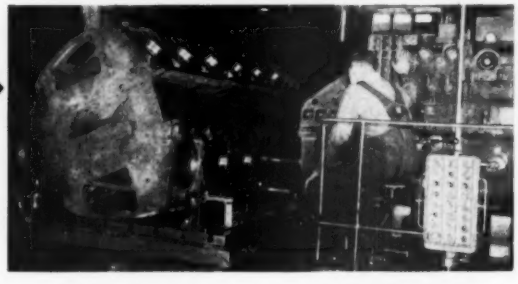
All bearings may be bored and faced on both sides, using a Davis line boring bar with expanding retracting type cutters. Or, if only two or three main bearings require reboring, the nearest sound bearings are bushed to support the boring bar as it bores and aligns the damaged unit.

Machining repair problems in Diesel shops are quickly and easily solved with this versatile G. & L. machine. You can end excessive locomotive downtime with this machine. Ask experienced G. & L. engineers how.



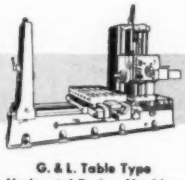
After this cylinder hole is bored, the crankcase will be rotated 90° to bore damaged main bearings.

Schematic drawing showing the method followed in reboring a cylinder liner hole.



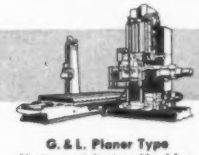
GIDDINGS & LEWIS
FOND DU LAC

G&L HYPRO

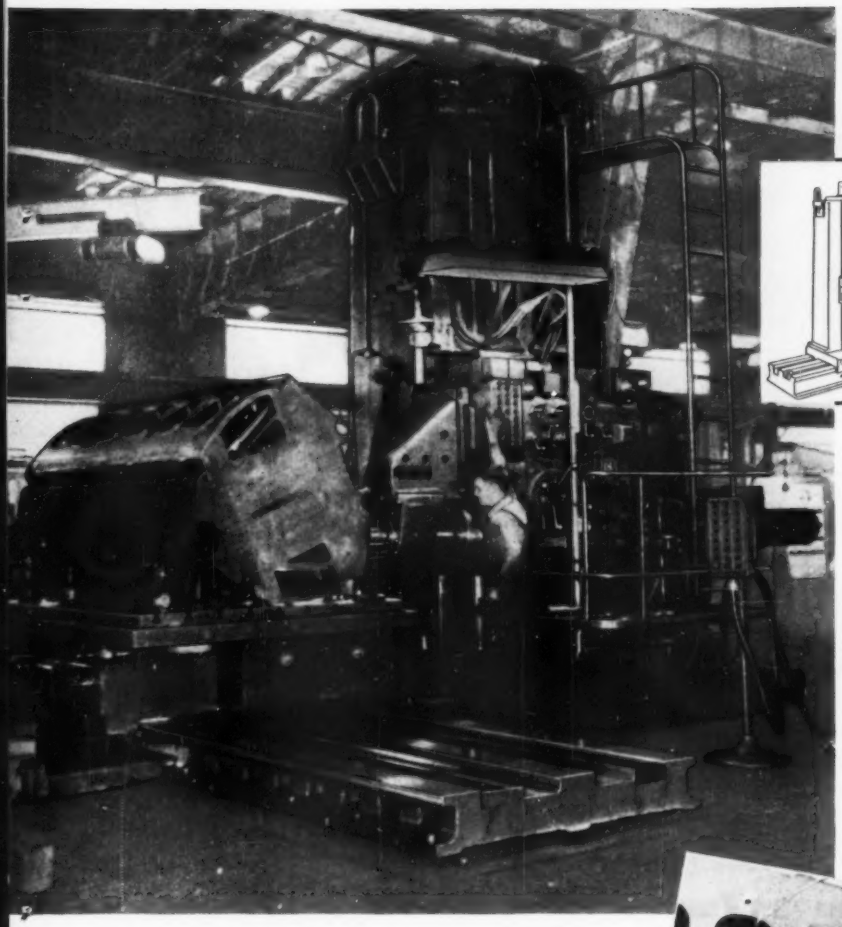


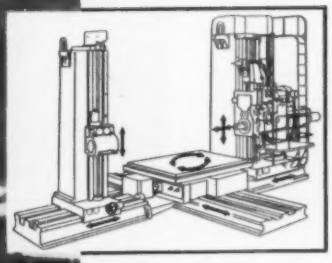
G. & L. Table Type Horizontal Boring Machine

G. & L. Floor Type Horizontal Boring Machine



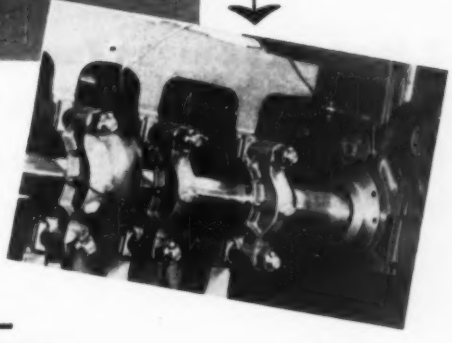
G. & L. Planer Type Horizontal Boring Machine





Only a single setup of this Diesel crankcase is required to perform different repair operations. Machine movements plus rotary table movements provide unusual flexibility for rapid positioning.

Reboring or refacing a main bearing is accomplished by bushing two bearings to support the bar. This is a typical G. & L. operation.

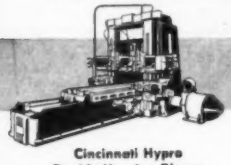


Typical Diesel Repairs Handled

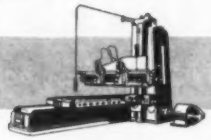
1. Line bore main bearings.
2. Re-serrate main bearings and caps.
3. Reface traction motor housings.
4. Rebore suspension bearings and end shields.
5. True crankcase by milling.
6. Re-machine mounting pads and surfaces.

MACHINE TOOL COMPANY

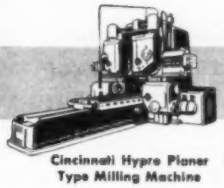
WISCONSIN, U. S. A.



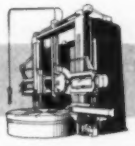
Cincinnati Hypro Double Housing Planer



Cincinnati Hypro Openside Planer



Cincinnati Hypro Planer Type Milling Machine



Cincinnati Hypro Vertical Boring and Turning Mill

DAVIS

Complete Tooling Service

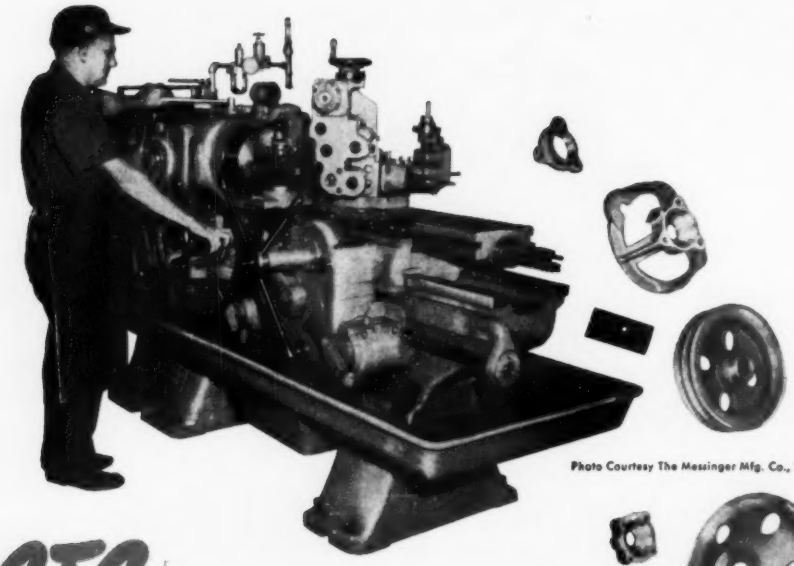


Photo Courtesy The Messinger Mfg. Co., Tatamy, Pa.

FACTS on improving production!

The Messinger Mfg. Co., famous for over 90 years as manufacturers of agricultural implements and woodworking machinery, replaced six machines with three modern Jones & Lamson Turret Lathes.

Now, large and small lots of sheaves, bearing caps, blowers, blower cases, worm gear housings, etc., are turned with peak efficiency and economy. ONE YEAR'S SAVINGS, BASED ON DIRECT COSTS ALONE, MORE THAN PAID FOR THE THREE NEW MACHINES AND EQUIPMENT.

3 Jones & Lamson Turret Lathes do the work of 6 other machines better, faster, cheaper!

Jones & Lamson Turret Lathes are Built and Powered to produce — MORE CHIPS PER TOOL — MORE PIECES PER HOUR — MORE PROFIT PER JOB — *than any other turret lathe of comparable size.*

Now, more than ever, the most efficient machines and methods are needed to make the most of your available manpower and material. Jones & Lamson is ready, willing and able to help you get maximum results from your turning, threading and inspection operations. Write *today* to Department 710.

Turret Lathes—Fay Automatic Lathes—Thread Grinders—Optical Comparators—Threading Dies

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Machine Tool Craftsmen Since 1835

New Type Grinding Disc Gives Sustained Top Production

GARDNER

abrasive discs

For Shear Cut Thru-Feed Operations

SMOOTH OUTSIDE AREA
provides shearing action for heavy stock removal

DEEP CORRUGATIONS
assure cooler, faster cutting . . . positive chip clearance and ample, free flow of coolant

108 A

GARDNER ABRASIVE DISCS
WITH EXCLUSIVE WIRE-LOKT CONSTRUCTION
Available in a full range of types and sizes for dry grinding, for wet grinding, for surface grinders.

Nation-wide service by Gardner Abrasive Engineers. Request 24-page abrasive catalog.

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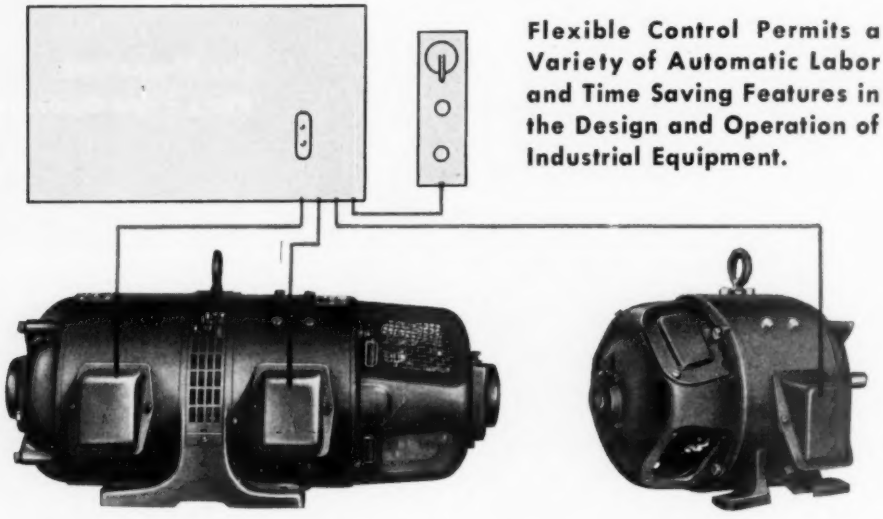
Century SELECTIVE SPEED Drives

For Operation From Alternating Current to Save Time and Labor

Flexible Control Over a Wide Range of Stable Production Speeds



Flexible Control Permits a Variety of Automatic Labor and Time Saving Features in the Design and Operation of Industrial Equipment.

All or any combination of the following features may be specified with Century SELECTIVE SPEED Drives

1. **WIDE RANGE AND SPEED VARIATION** — 8 to 1 ratio is a standard — 16 to 1 or 32 to 1 is available.
2. **PRACTICALLY STEPLESS CONTROL** — Smooth acceleration and deceleration for any character of load.
3. **STABLE SPEEDS** — Even with varying loads.
4. **JOGGING CONTROL** — Jogging at preset speed is always available.
5. **PRESET SPEED CONTROL** — Automatically accelerates to speed preset by the control.
6. **DYNAMIC BRAKING** — For quick, automatic stopping or where controlled deceleration of load is required.
7. **REVERSING OPERATION** — Jog in reverse, or run in reverse, or both as specified.
8. **MULTIPLE DRIVING UNITS** — With related speeds controlled from a single control.
9. **CONTROL LOCATION** — "Start" — "Stop" — "Jog" — "Reverse" or change in speed may be controlled from any number of locations.
10. **TYPES OF REMOTE CONTROL** — Variety of control accessories may be incorporated into the functional design of your equipment to provide automatic time and labor-saving features.

Century SELECTIVE SPEED Drives are manufactured in sizes from 1 to 150 horsepower.

Call a Century motor specialist who will help you analyze your motor application problems.

Century manufactures a complete line of alternating current, single and polyphase and direct current motors and generators, 1/6 to 400 horsepower — 500 Watts to 300 KW. Popular types and standard ratings are generally available from factory and branch office stocks.

Century C MOTORS

CENTURY ELECTRIC COMPANY • 1806 Pine St., St. Louis 3, Missouri

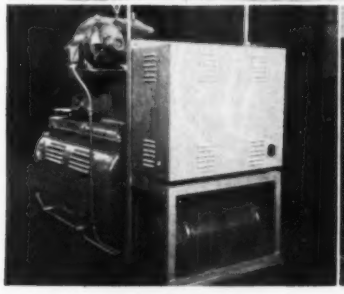
Century Electric Company is celebrating its 50th year in the electrical industry

Century SELECTIVE SPEED Drives

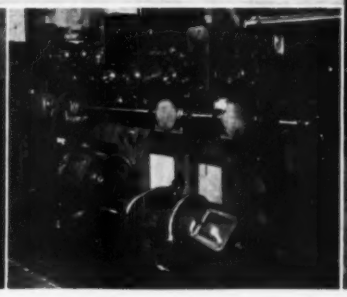
Permit Exact Speed Control for Increased Production • Better Quality Control

Here are a few typical applications

that demonstrate the benefits which you can get from Century Selective Speed Drives on either new equipment or your present set-up.

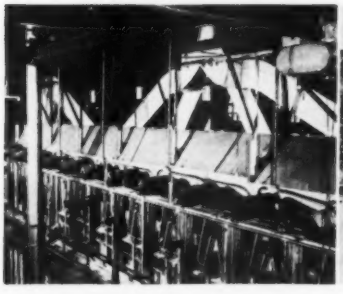


Production increased, machining quality was improved, accuracy is held closer and set-up time is reduced as a result of achieving optimum peripheral cutting speeds on this boring mill.

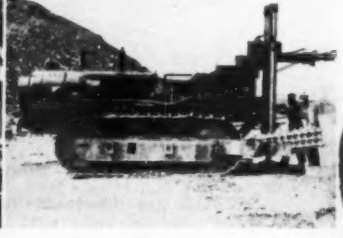


Costs are cut and scrap is reduced because maximum speeds are easily controlled for different classes of work done on this printing press. Accurate control maintains exact register of multiple copy forms.

Better quality control is maintained over production of latex threads because of the wide selection of speeds plus smooth acceleration and deceleration. Extreme flexibility permits fast change-over when a new gauge, or size, of rubber thread is to be produced. Instant stopping is also an important protective feature.



Uncoilers and coilers with pinch rolls and looping device, require a wide range of inter-related automatic sensitive speed changes. As the coils of material unwind from one spool and wind on another spool, the diameters change yet the speed through the electrolytic process must be at a constant rate.



Operating speeds are instantly controlled on this earth auger drill rig. Permits operator to change speeds according to the type of earth being drilled. Drilling is done to depths of 100 feet in strip mining.

For more details on Century Selective Speed Drives, from 1 to 150 horsepower, call the Century office nearest you. Your local Century representative can also furnish information on the complete line of Century motors, from ⅛ to 400 horsepower.

CENTURY ELECTRIC CO.

1806 Pine St. • St. Louis 3, Missouri

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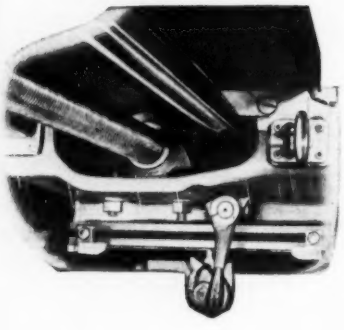
Century Electric Company is celebrating its 50th year in the electrical industry

SMOOTHER FEED

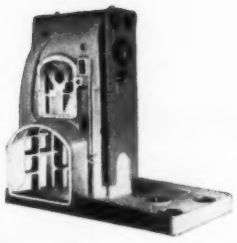
A new line of Knee-Type Milling Machines

KEARNEY & TRECKER MILWAUKEE **CK's**

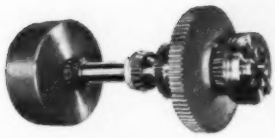


YOU'LL get the smoothest feed performance ever on Kearney & Trecker's new CK milling machines. Why? Because these CK's have a new design, heavy duty, 2" diam. table feed screw rotating through an extra-long table feed nut — giving you more bearing contact. That means smoother power feed. Add the positive-acting backlash eliminator and you get CK's smoother, more effective climb milling. What's more, the separate motor drive for table feed is interlocked with the spindle drive motor for overload protection. No danger of stalling cutters in cut. But smoother feed is only one of many pace-setting CK features. Look at all the others. You'll see why CK's are the most productive, profitable milling machines you can buy today — anywhere!

Replacement of obsolete machine tools is an



GREATER RIGIDITY — Yes, these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more metal scientifically distributed in heavier ribbing, box section, sponson construction . . . to effectively absorb vibration from heaviest cutting loads.

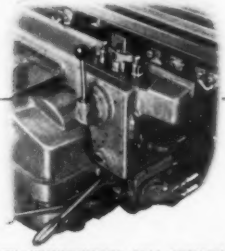


GREATER CUTTING EFFICIENCY — Added momentum of spindle-mounted flywheel assures longer cutter life and greater efficiency, through smoother, more positive drive — a key to most efficient use of modern cutting tools. Spindle rigidly supported by Kearney & Trecker's original 3-bearing design.

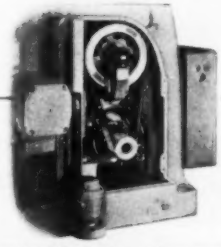
GREATER ADAPTABILITY — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

NON-GLARE RAPID-SET DIALS—You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a satin surface with high contrast markings. They're easy and quick to set and provide positive lock at every setting.

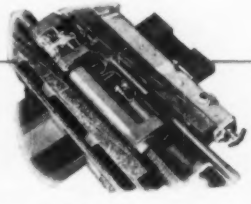
FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from $\frac{3}{16}$" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE—Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time on both long and short run lots. Operators will like it because it makes faster, simpler, less fatiguing work for them.



GREATER HORSEPOWER — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.



GREATER MACHINE LIFE — through automatic lubrication and generously proportioned gears and shafts throughout for overload conditions. There's a forced flood system in the column and knee, and a positive metered, pressure pump system for table, saddle and knee ways, and table feed assembly.

Kearney & Trecker's new CK line of knee-type machines is designed to meet every demand of present-day milling . . . making them more accurate, and MORE PRODUCTIVE for you. Contact your Kearney & Trecker representative or write direct to obtain their complete specifications. Find out how CK machines easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

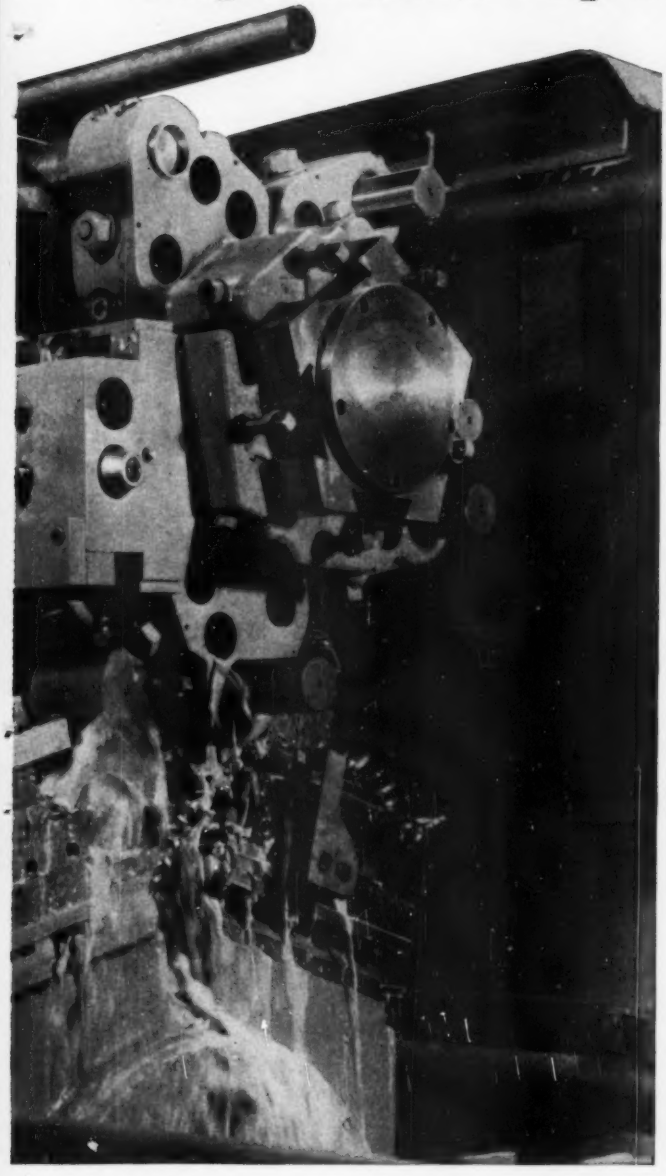
investment that makes Dollars and Sense.

An especially

Warner & Swasey 1-AC Automatic Chucking Machine used at THE COOPER ALLOY FOUNDRY CO., *Stainless Engineering & Machine Works Division, Hillside, New Jersey.*

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER

important story today....



PRODUCTION UP 220% —YET WITH FEWER OPERATORS!

● Take a look at the record of Warner & Swasey 1-AC Single Spindle Automatic Chucking Machines, used at The Cooper Alloy Foundry Co., to machine Cast Type 316 Chromium-nickel stainless steel Valve Nuts. These automatic machines increased production 220%, reduced floor-to-floor time 69%, turned out more uniform parts, substantially cut costs per part. Yet they required no additional setup time.

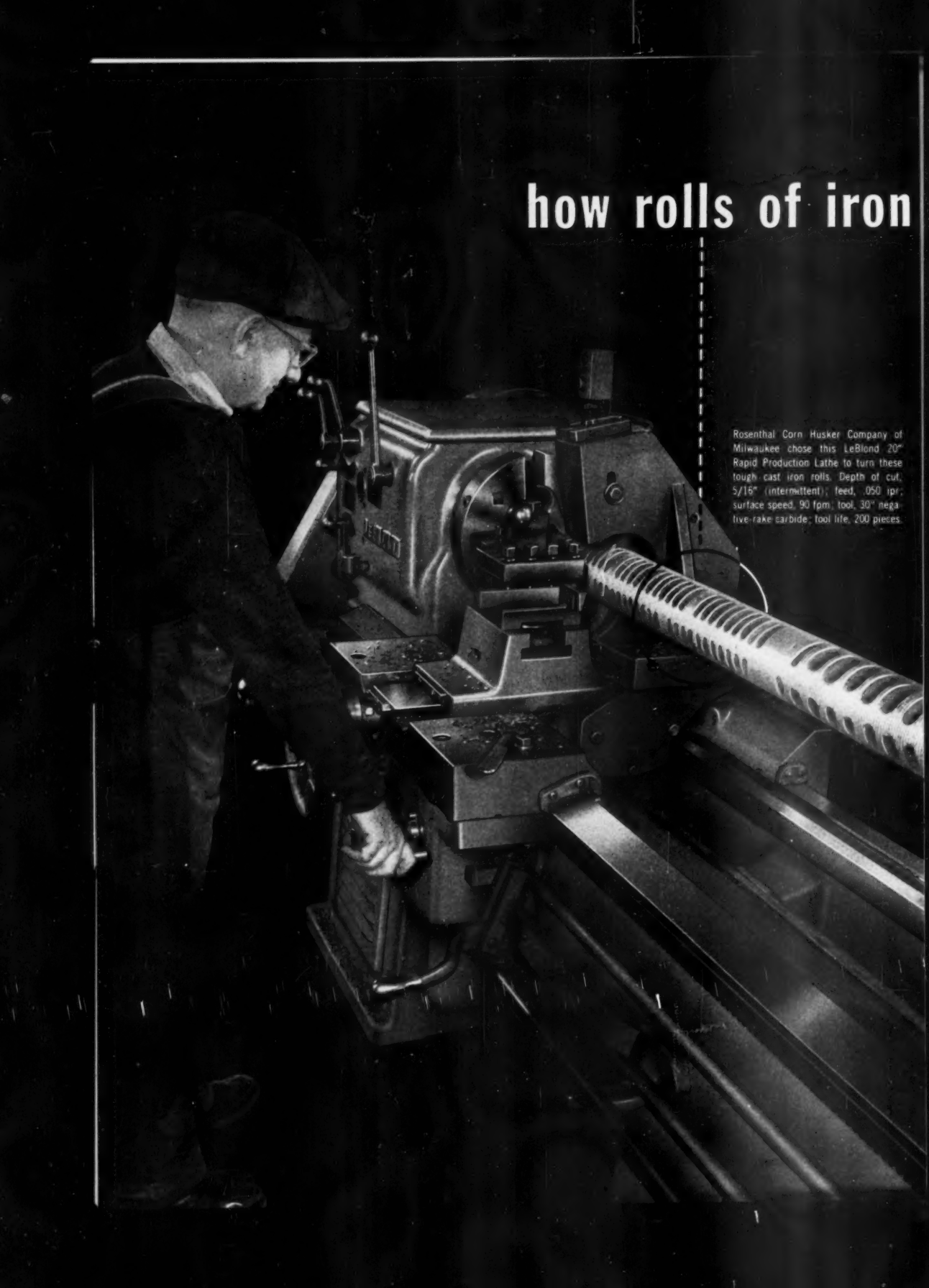
In today's tight manpower market the 1-AC Automatic is taking on increasing importance to management. One man can handle two machines—with each machine turning out substantially more production than an individually-manned, hand-operated machine.

Certain types of machining jobs in your plant can undoubtedly be done better, faster, more profitably—and with less manpower—with the 1-AC Automatic. To find out just how the 1-AC fits into your production setup, call in your nearest Warner & Swasey Field Representative, or write The Warner & Swasey Company, 5701 Carnegie Ave., Cleveland 3, Ohio.

WARNER & SWASEY *Cleveland*

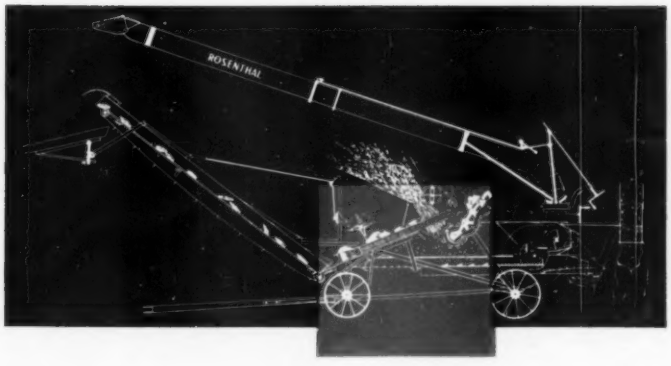
& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

how rolls of iron



Rosenthal Corn Husker Company of Milwaukee chose this LeBlond 20" Rapid Production Lathe to turn these tough cast iron rolls. Depth of cut, 5/16" (interwittent); feed, .050 ipr; surface speed, 90 fpm; tool, 30° negative-rake carbide; tool life, 200 pieces.

help put meat on your table



At the heart of machines that husk corn and shred the stalks into fodder are iron rolls like these! They help the farmer convert his crop to feed for livestock—the steers and hogs that become tender steaks and juicy hams for your table.

Rosenthal Corn Husker Company of Milwaukee, builders of husker-shredder machines for more than sixty years, needed a production lathe to turn these rolls . . . a lathe rugged enough to take the beating of a 5/16" intermittent cut at .050" feed and 90 surface feet per minute, and to withstand the forces of a 30° negative-rake carbide tool, cutting iron hardened by casting around a steel shaft!

On the recommendation of LeBlond's Chicago Office, they put a LeBlond 20" Rapid Production Lathe on the job. Result? *Three and a half years of rough yet trouble-free production . . . and many more to go!*

A LeBlond 20" Rapid Production will give you high production turning of a *variety* of work within the range you choose. It offers two speed ranges, 45 to 300 rpm or 67 to 450 rpm, and 18 feeds from .005" to .150".

Not a converted engine lathe, it has no quick-change box or leadscrew, expensive features unnecessary for production work.

Whether you're turning rugged rolls or precision shafts, there's a LeBlond Lathe to turn them faster, better. Your LeBlond Distributor will tell you about the 20" Rapid Production and other late models. Call him or write—

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Ask for Bulletin RP-220 A for more information on the 20" Rapid Production Lathe.

turned faster by

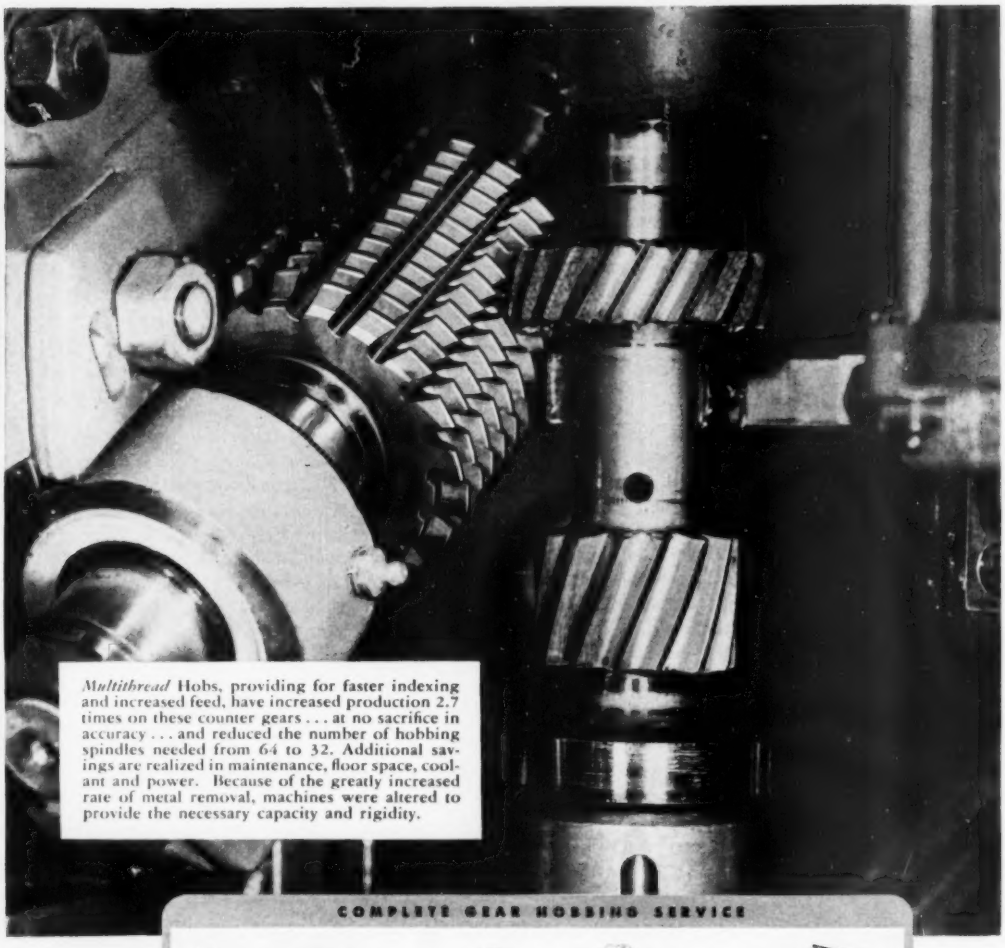
LEBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 63 YEARS*

Barber-Colman

Multithread Hobs

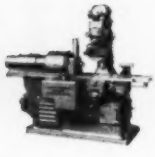
TRIM GEAR CUTTING COSTS

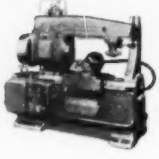


Multithread Hobs, providing for faster indexing and increased feed, have increased production 2.7 times on these counter gears . . . at no sacrifice in accuracy . . . and reduced the number of hobbing spindles needed from 64 to 32. Additional savings are realized in maintenance, floor space, coolant and power. Because of the greatly increased rate of metal removal, machines were altered to provide the necessary capacity and rigidity.

COMPLETE GEAR HOBBING SERVICE

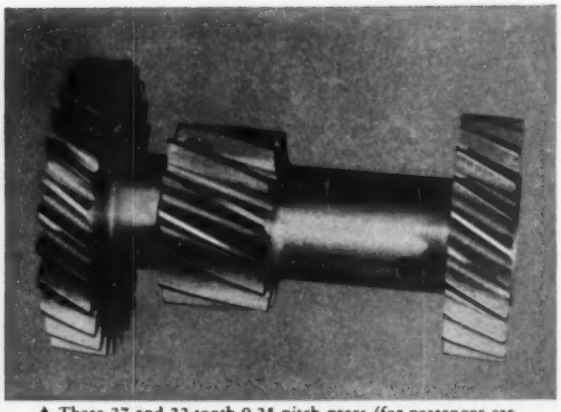
BARBER COLMAN ®





HOBS • MACHINES • SHARPENING • TECHNICAL DATA

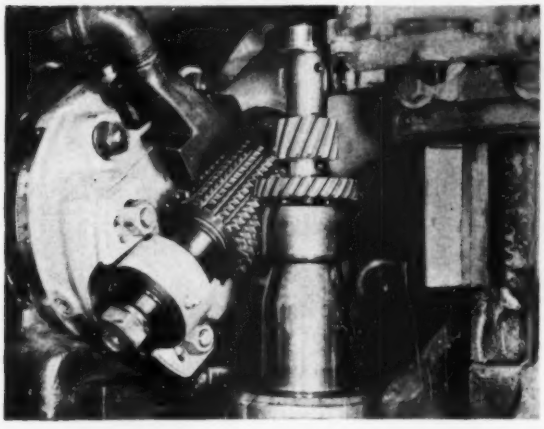
▲ These 4" x 4" *Multithread* hobs have more gashes for finer finish. A taper hole eliminates runout, holding the pitch line of the cut gears to maximum concentricity. Precision spacing of 3 leads produces involute and tooth spacing to preshave limits.



▲ These 27 and 22-tooth 9.25 pitch gears (for passenger car and truck transmissions) are forged from AISI 5145 or 8620-H steel. *Multithread* hobs have cut costs per gear to slightly over 1/3 former average. Lead errors are held within .0005". Production per hour has been increased from 26 to 82 gears (net, at 85% efficiency).

Automotive Plant Pioneers New Hob Application with Barber-Colman Hob Engineers. Disregards Conventional Hob Design to Almost Triple Production. Cuts Costs to ⅓ Previous Average.

▼ The 27-tooth gear on the counter gear is hobbed at 156 rpm and 062" feed. Previous feed was .053". Face width is 5/8". Cutting time per gear has been reduced from 6.55 to 2.2 minutes. Remarkable savings are possible because of increased feed and faster indexing with *Multithreads*.



The 22-tooth gear on the counter gear is hobbed at 156 rpm and .052" feed. Cutting time is 2.16 minutes. Single-thread ground hobs formerly cut at .043" feed. Hobbing time averaged 6.13 ◀ minutes per gear.

Multithread Hobs are a development by Barber-Colman engineers, providing faster indexing in the hobbing of gears. Instead of the usual single lead, *Multithreads* have several threads, and have produced unusual production increases on gear cutting jobs requiring very high rates of output.

As a result of production gains possible with hobs of this design, a fewer number of hobbing machines are required to complement the finish shaving and grinding equipment.

Multithreads are recommended only on the basis of comprehensive analysis of the job factors in individual plants. Therefore, we suggest that you ask a Barber-Colman Representative to call.

Write for additional information about the production increases possible with *Multithread* Hobs.

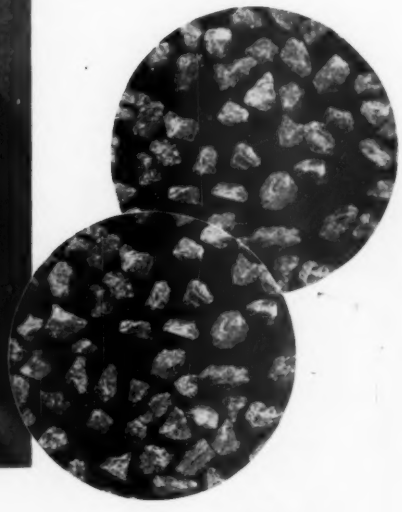
Barber-Colman Company

GENERAL OFFICES AND PLANT, 316 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

BUILDERS OF PRECISION GEAR HOBS AND MACHINES SINCE 1911

ALUNDUM ABRASIVE LASTS LONGER... POLISHES BETTER...

Because Every Grain Works!



One of the biggest advantages of Norton ALUNDUM Polishing Abrasive is its complete uniformity of grain-size and shape. This means you get no oversize grains to mar the finish — *and no undersize grains to loaf on the job.* That's why, with every grain a working grain, ALUNDUM Abrasive lasts longer and performs better.

In addition, ALUNDUM Abrasive is uniform in chemical composition and crystal structure — extremely hard and tough for fast, clean cut — and has high capillarity that assures firmer adhesion of grain to wheel when glue is used as the adhesive. It is available in sizes and with surface treatments for best results on every polishing job.

Write for Norton Booklet No. 1340, "Setting-Up Polishing Wheels and Belts," containing many helpful polishing tips.

NORTON COMPANY
WORCESTER 6, MASS.
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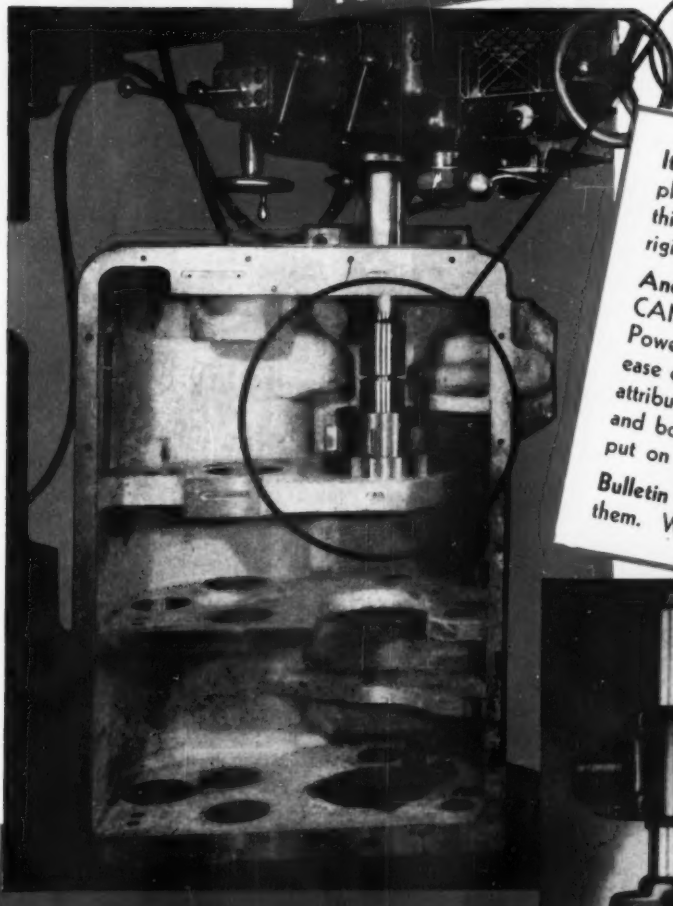
NORTON
ABRASIVES
Making better products to make other products better

A GOOD SPINDLE

FOR GOOD BORING AND TAPPING . . .

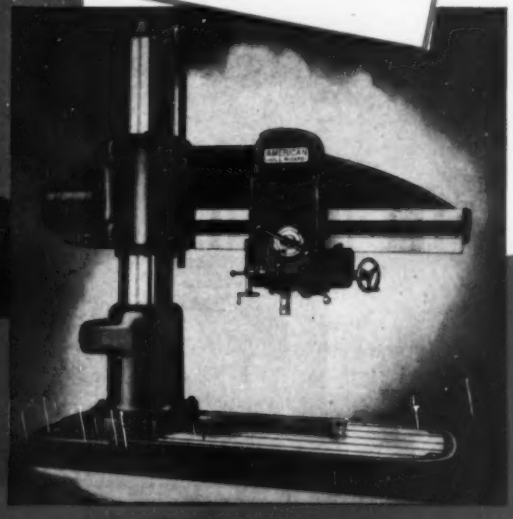


Here's a 10" tapping job on a 5-foot "AMERICAN" Hole Wizard Radial

It takes a sturdy, rigid machine with plenty of power to do work like this. Especially does it require a rigid and smooth-acting spindle.

And that's exactly what "AMERICAN" Hole Wizards are noted for. Power—rigidity—convenience and ease of control are "AMERICAN" attributes that cut drilling, tapping and boring costs wherever they are put on the job.

Bulletin No. 327 tells all about them. Want one?



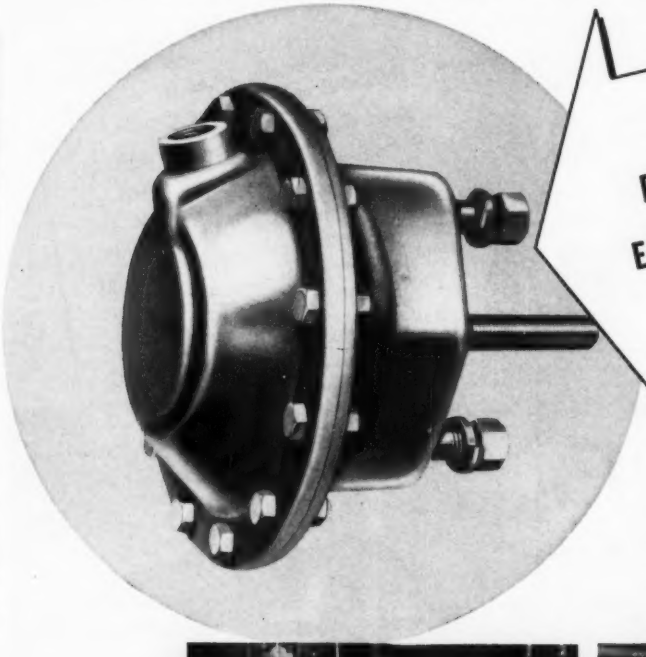
THE AMERICAN TOOL WORKS CO. Cincinnati, Ohio U.S.A.

Lathes and Radial Drills

Modernize Even Your Latest Machine Tool Operations with

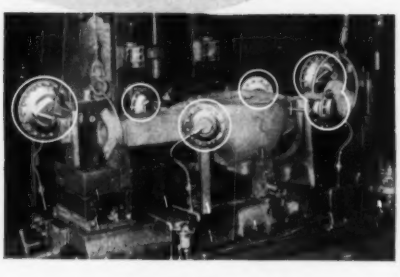
ROBOTAIR

THE INDUSTRIAL AIR CONTROL OF A THOUSAND USES



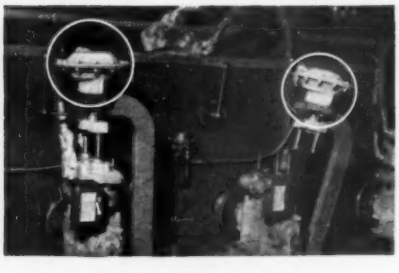
THIS SIMPLE, RUGGED, LOW COST, EASILY INSTALLED UNIT DOES THE JOB

A rugged air chamber that may be used wherever a short, powerful stroke is needed for holding, positioning or clamping. Produced in six different sizes with strokes from 1¾ inches to 3 inches. Also available is a smaller diameter ROTOCHAMBER which provides an even longer stroke with a similar pressure output. Your present air supply will be adequate for either, but compressors are available if needed.



SAVES MONEY

Savings realized on this operation for manufacturing axle housings by replacing hand screws and clamps with Robotair Chambers have *amounted to hundreds of dollars.*



CUTS HANDLING TIME

Before installation of Robotair on this compressor run-in test line, compressors were held in position by manually operated clamps. Simple adaptation of Robotair Chambers and two-way valves *cut handling time in half.*

...AND STEP UP YOUR PRODUCTION AS MUCH AS 30% WITHOUT ADDING MANPOWER

Amazing Savings in Time, Money and Effort

Bendix-Westinghouse, world's largest source of air brakes and other air devices, put more than a quarter century of experience behind the development and perfection of Robotair Industrial Controls. With their wide range of applications, these air controls now offer progressive manufacturers amazing improvements in production speed and economy at an *unbelievably low initial cost.* Ideal for holding, clamping, bending, swedging, staking, riveting, and compactly designed for easy installation on space limited machinery, Robotair Controls inevitably bring about lower manufacturing costs per unit through increased productivity of man and machine. Rugged, frictionless, leak-proof construction positively eliminates need of oilers and filters and assures millions of strokes at *100% efficiency for total life.* Low cost Robotair units are available as original equipment for machinery manufacturers or for installation on present shop equipment. To find out how Robotair can improve your production picture, send for your copy of the colorful Robotair booklet. Coupon at bottom of page.

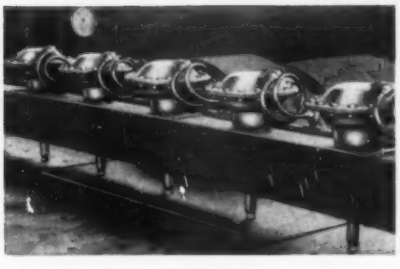
Industrial Distributors in All Major Cities.

Bendix-Westinghouse

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY • ELYRIA, OHIO

BENDIX-WESTINGHOUSE ROBOTAIR

REG. U. S. PAT. OFF.



REDUCES OPERATOR FATIGUE

Various sizes of steel plates are held in position by series of Robotair Chambers in this end grinding operation. Use of Robotair eliminated battery of hold down bolts and clamps, greatly reducing operator fatigue.

BENDIX-WESTINGHOUSE
Automotive Air Brake Co.
Elyria, Ohio Dept. C

Please send me your free booklet on "Robotair—the Industrial Air Control of a Thousand Uses."

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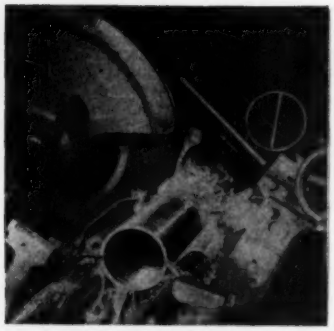
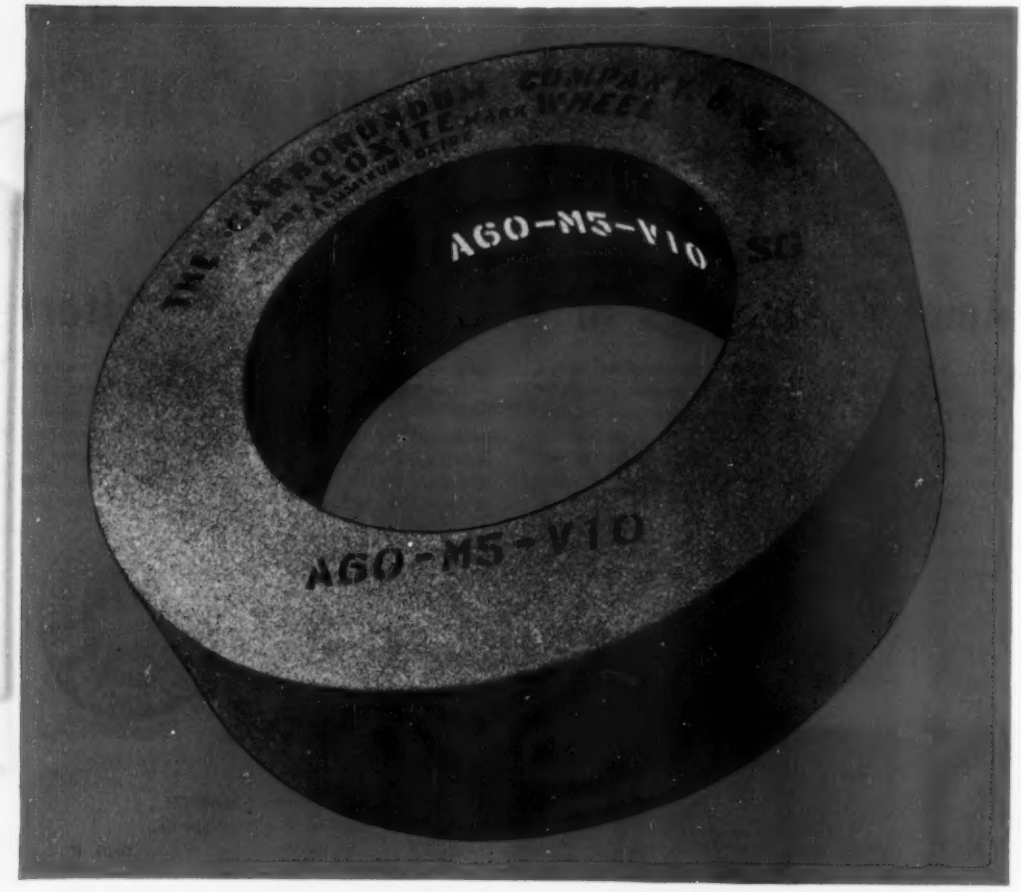


Improved Centerless Wheel Grinds RIGHT!

CARBORUNDUM'S improved V10 Bond Grinding Wheels are engineered to maintain grinding efficiency with minimum contact pressure. Their continuous cool, free-cutting qualities produce dimensionally accurate work to required finishes... free from chatter marks, scoring, or burning. Ideally suited to heavy stock removal on both hard and soft materials, these wheels are being used increasingly in the entire range of centerless work, throughfeed and infeed. Your CARBORUNDUM representative will be glad to discuss proper gradings and applications in obtaining most effective results. Write Dept. AM 81-20.



Only CARBORUNDUM

TRADE MARK

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, N.Y.

makes ALL Abrasive Products ...to give you the proper ONE

81-20

Production Pointers from GISHOLT

TIME-SAVING IDEAS

Why Gisholt's Recommendations Are Unbiased. In helping you solve your turning problems, Gisholt engineers have no reason to favor one type of machine over another except on the basis of its ability to best serve your needs. For Gisholt manufactures both manually operated turret lathes and automatic lathes.

BOTH MACHINING AND SUPERFINISHING DONE ON ONE MACHINE

Production Stepped Up, Manpower Saved by Double Feature Machine

Here's the *first* time machining and Superfinishing have ever been combined in one chucking! There will be more of this sort of thing.

The two separate functions on cast-iron truck flywheels are combined on this standard Gisholt No. 12 Hydraulic Automatic Lathe with simple Superfinishing attachments.

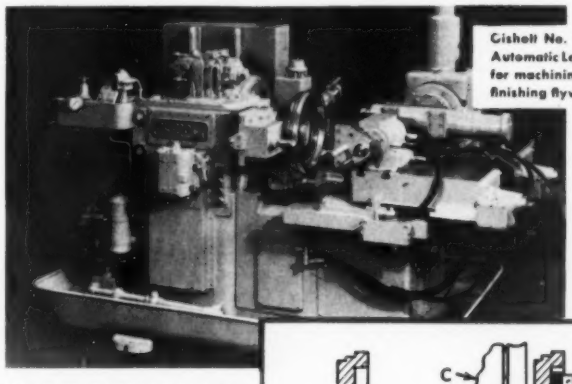
Here's a really smart tooling arrangement. The machining cycle is worked out so that the main front slide, as it moves to bore the rim, engages a plunger which actuates the headstock auxiliary slide to finish turn the back hub. The front slide then completes its cycle of facing the clutch surface.

How Superfinishing Takes Over

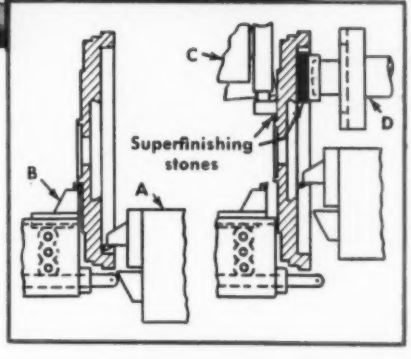
As the cutting tools clear the work, the two rear slides with Superfinishing attachments (instead of tools) move into position. A rear auxiliary slide mounted on the headstock carries a No. 1 size attachment for finishing the oil seal bearing on the hub. Superfinishing brings the surface from 150-200 micro-inches RMS down to 3 to 6 micro-inches RMS. Grinding operations are eliminated in getting this ultra-fine finish which leaves no roughness to abrade the packing and cause future oil leakage.

The main rear slide carries a No. 4 size attachment for Superfinishing the clutch surface which measures 150-200 micro-inches RMS after facing. This surface *must* be flat and smooth for good friction area. To protect against excessive wear and tear of the clutch plate, the marks left by turning are entirely removed so there is true "base metal" and the desired surface finish of 20-30 micro-inches RMS is readily obtained. Total time for all operations is only 5.8 minutes, floor to floor. Of this, Superfinishing requires less than one minute.

Summing it up—this one machine in one chucking, and in a continuous automatic cycle; (1) finish bores the flywheel rim; (2) finish faces the clutch surface; (3) finish turns the hub and oil seal; (4) Superfinishes the oil seal; and (5) Superfinishes the clutch face.



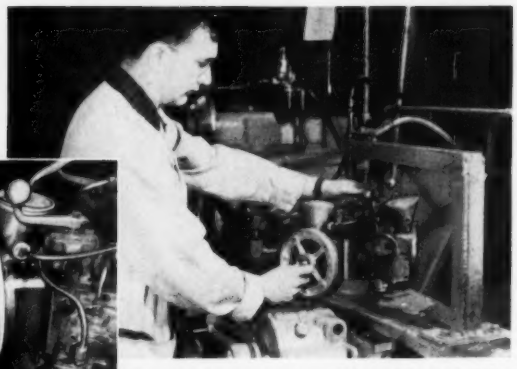
Gisholt No. 12 Hydraulic Automatic Lathe equipped for machining and Superfinishing flywheels to 24".

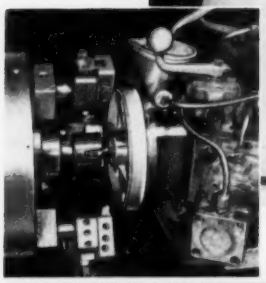


MACHINING OPERATIONS—As front slide (A) feeds in to bore rim, plunger starts slide (B) that finish turns the back hub. When front slide starts feeding inward, angle of contact cam allows plunger to return to original position.

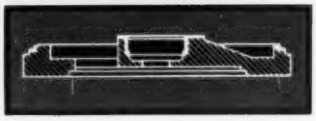
SUPERFINISHING OPERATIONS—Rear slide (C) holds a No. 1 Superfinishing attachment for finishing oil seal bearing. Slide (D) with No. 4 attachment finishes clutch plate face. The abrasive stones scrub away the amorphous metal to produce desired finish.

TURN-ABOUT IDEA DOUBLES PRODUCTION





Operator places part on turret fixture while one is being machined by spindle-mounted tools. (Left) Tools mounted on spindle face plate.



Heavy lines show surfaces machined in this novel reverse setup.

Look at this tool setup again. That's right, they've reversed the usual procedure in machining aluminum die cast end frames. Tools are *on the spindle*—work is on the turret faces. Credit for the idea and tooling goes to Mr. H. L. Stephenson of the A. O. Smith Corporation (formerly Whirl-A-Way Motors, Inc.), Tipp City, Ohio.

The job is on a Gisholt No. 4 Ram Type Turret Lathe. Adjustable tools are mounted on a face plate on the spindle. Carrying out the reverse play—three separate holding fixtures for the workpiece are mounted on alternate faces of the turret. The parts are held rigidly on the fixtures by an air-operated bar and a C-washer.

Think of the advantages! The spindle runs continuously with no lost time for starting, stopping, chucking and unloading.

Production goes as high as 1000 pieces per 8-hour shift—a real tribute to smart planning and a fast turret lathe. Moreover, there's real accuracy, too: tolerance in the bore is consistently held to ± 0.0001.

With the parts on the turret and tools on the spindle, machining is continuous except for the brief time needed for indexing new part into position.

A GOOD SETUP FOR THIS DIFFICULT CYLINDER LINER JOB!

Careful Planning Simplifies Machining Problems on Big Parts

This smart setup on a standard Gisholt 5L Saddle Type Turret Lathe licked a lot of problems for a manufacturer of diesel engines.

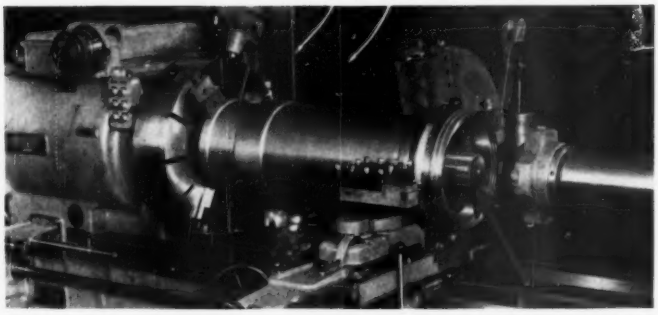
A 15" 3-jaw scroll chuck is mounted on one face of the hexagon turret to center and support the big, heavy liners during preliminary machining of the diameter which later takes the steadyrest. Adjacent surfaces, best handled before the steadyrest is applied, are also machined then.

Novel Boring Bar Arrangement

Note the arrangement for piloting the multiple cutter boring head. The big pilot bar is hydraulically advanced, thereby providing excellent support for the boring head. Also, because it can be retracted within the spindle, it does not interfere with loading and unloading—making it possible to do this job on a machine of standard bed length.

Now, look at the steadyrest. It's supported on the rear way and carrier of the bed—leaving the front way unobstructed so the square turret can work anywhere. Thus, other machining can be done while the long bore is being finished.

Using a chuck on 1 face of the hexagon turret . . . retractable pilot bar . . . and steadyrest help permit other machining operations to be done while boring—all help make this job simpler, faster.



An unusual setup on a Saddle Type Lathe for machining diesel engine cylinder liners. Arrow shows pilot bar which not only supports boring head but retracts back into spindle for loading and unloading.

Liners—rough and after machining on 5L Saddle Type Turret Lathe.

GISHOLT

GISHOLT TIME-SAVING IDEAS

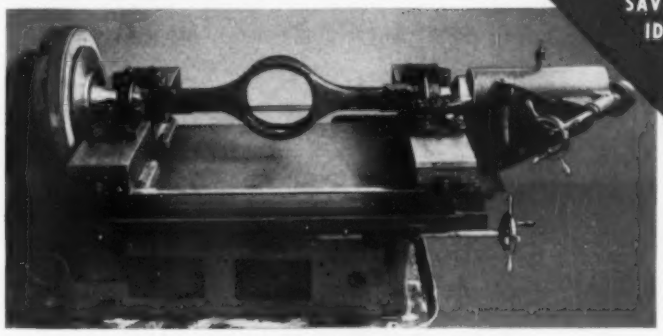
BOTH ENDS OF AXLE HOUSINGS FINISHED AT SAME TIME ON SIMPLIMATIC

A Simple Way to Big Savings

Both ends of these truck axle housings are rough and finish turned at the same time by a Simplimatic Automatic Lathe. The machine is standard except for the tailstock and a longer table. All tools are standard.

Driving is done by an internal chucking device, having 3 separate eccentric rollers, each mating with a common gear so the three operate simultaneously to centralize the piece. There's an expanding chuck in the tailstock for centering and carrying the outer end of the housing.

Both flanges are faced on both sides and turned, and the housing ends are faced and formed on both sides of the lugs. Four slides with four groups of tools all working together take care of all rough and finish machining.



Simplimatic setup for machining both ends of axle housing at one time.

The Simplimatic proves its adaptability on this job by rough and finish turning both ends of part at same time.

AUTOMATIC RECESS BORING ATTACHMENT FOR CLUTCH SLEEVES

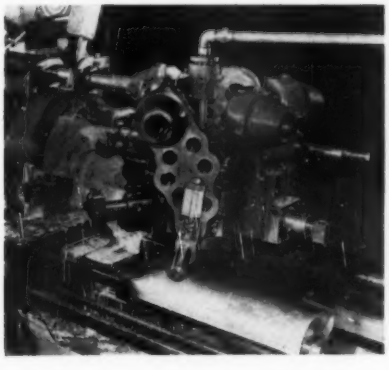
1 Turret Lathe Takes Over Work of 2

Here's how a Fastermatic Automatic Turret Lathe, equipped with a standard recess boring tool, was able to eliminate subsequent operations on a second machine.

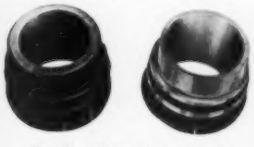
On this clutch sleeve, machined from a steel casting, the manufacturer was using two machines to perform the two operations required to finish the bored diameters. A Fastermatic finished the bore, and another lathe then did the recess boring.

A Standard Automatic Recess Boring Tool was recommended for the Fastermatic—and the job was then handled on this one lathe. Floor-to-floor time was reduced to 8 minutes, 20 seconds, and a second machine and operator are freed for other work. In addition, more concentric diameters are achieved by boring both on the same chucking.

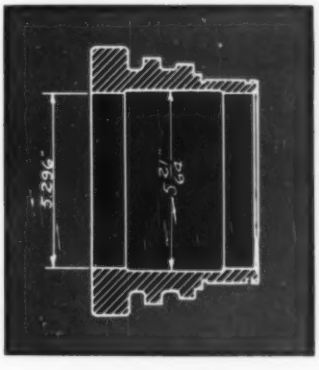
Simply by using a Standard Boring Attachment on his Fastermatic Lathe this manufacturer was able to save an extra machine and operator.



This Fastermatic with standard boring tool does job formerly requiring two lathes.



Rough casting as it goes to the Fastermatic and the semi-finished clutch sleeve.



Drawing shows 5-$^{21}/_{64}$" recess handled by Fastermatic automatic recess boring attachment.

GISHOLT

TIME-SAVING IDEAS

HOW SUPERFINISHING SOLVES 2 PROBLEMS AT ONCE

Two surfaces are Superfinished at same time by this Automatic Superfinisher.

Close-up shows two sets of Superfinishing stones to handle both oil seal and bearing fit diameters.

Assures Oil Seal and Protects Bearing Fit on Variable Pitch Airplane Propellers

Imagine the problems in keeping oil-tight seals on an adjustable pitch airplane propeller turning so fast you can't see it.

There are not only the questions of oil pressure and changing pitch, but terrific centrifugal force as well. Superfinish provides a degree of smoothness which makes possible and protects the nicely fitted oil-tight bearing of the blade in the hub.

Also, the roller bearing at the shank end must be a tight press fit. This fit is insured and preserved through Superfinish, which removes all amorphous smear metal which could break down or score this critical surface.

An Automatic Superfinisher handles both surfaces in a single operation. The 4½" diameter is ground to approximately 30 micro-inches, and the Superfinishing is completed in only 45 seconds—with floor-to-floor time depending on the handling equipment available for the big blades.

Superfinishing, by removing all amorphous "smear metal" on variable pitch airplane propellers: (1) assures oil-tight seals, and (2) permits right press fit of blade in hub.

Fine surface finishes are solving troublesome problems like these in all industries. For complete information on Superfinishing, write for free booklet, "Wear and Surface Finish."

HEAVY FANS BALANCED FOR LONGER BEARING LIFE

Service Problems Are Reduced

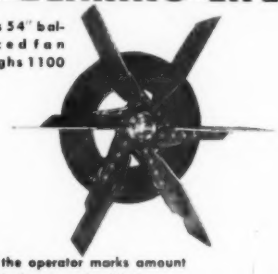
Balancing is just as vital for unwieldly parts, like these heavy fans, as it is for smaller high-speed rotating members.

The Raymond Pulverizer Division of Combustion Engineering-Superheater Inc., Chicago, knows this. Components of its pulverizing and drying systems are these large fans for exhausting air and materials, such as coal dust. In service, the fans turn anywhere from 900 to 1200 r.p.m. They are fabricated of heavy steel plate and range from 40" to 80" in diameter, and weigh up to 2000 lbs. Production by size runs in lots of from 6 to 10.

The spiders as well as the entire assembly are dynamically balanced on a Gisholt 3U Dynamic Balancer—to as little as one-tenth ounce inch. The machine gives a direct reading of the amount of corrections required and where they are to be applied with no additional calculations or cut and try procedure. Corrections are made without removing the workpiece and by adding metal weights or deposits of weld metal. Balance is rechecked.

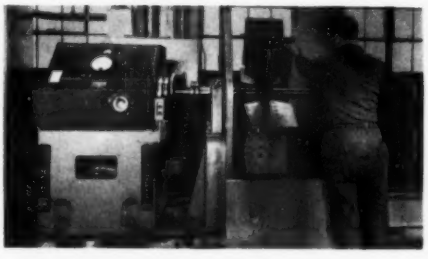
This whole balancing job is thus completed in 1 operation, on 1 machine with a minimum of time, cost, floor space and handling.

DYNETRIC BALANCERS GISHOLT



This 54" balanced fan weighs 1100 lbs.

Left, the operator marks amount of unbalance on fan blade.



The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT Balancing School

Because of the fast-growing use of balancing—Gisholt, in answer to industry-wide requests, now offers complete courses in the theory and practical application of balancing. Two and three week courses are open to maintenance men, production men, process engineers and others. Because class enrollments are limited for closest personal attention, write for complete information now.

No. 651
569

GISHOLT

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

A general catalog on machines listed below is available on request.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

GET THE MOTOR that Cleans Itself

DROP YOUR MAINTENANCE COSTS to a new low by reducing motor cleaning operations and reducing inspections and overhauls. Tests have proved that on most applications totally-enclosed, fan-cooled motors more than pay back their extra cost in reduced maintenance. And this new Allis-Chalmers Type APZ tefc motor makes maintenance costs lower than ever before on this type of motor.

Here's Why

Concealed air passages and pockets have been eliminated; dirt cannot build up to cause overheating. Cooling air is blown over the ribbed cast iron frame and bearing housings carrying dirt away with it. How about oily dirt that sticks? It can be wiped or blown off without stopping the motor.

Rigid Construction

The frame is rigid cast iron which not only has high inherent corrosion resistance, but also holds bearings in alignment. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Dealer or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144. A-3398

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

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Sold . . .
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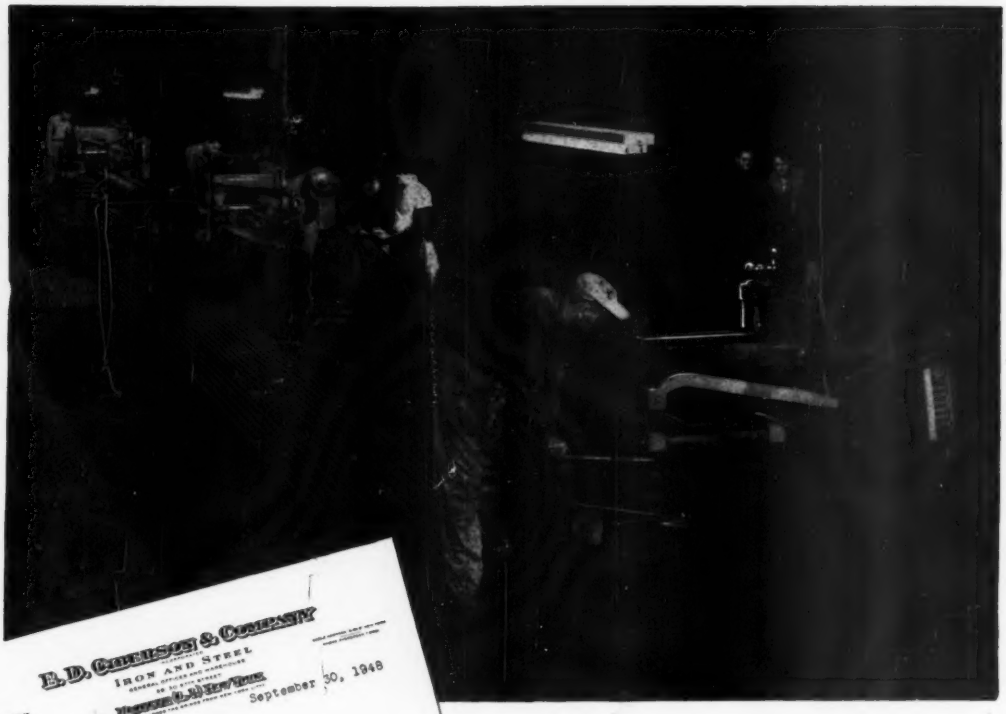
by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.



E. D. GIBERSON & COMPANY
IRON AND STEEL
NEW YORK, N.Y.

September 30, 1948

Armstrong-Blum Manufacturing Co.,
Chicago, Illinois

Gentlemen:

For almost half a century as direct distributors of Boiler Tubes, Condenser Tubes in seamless steel, electric welded steel and stainless steel, as well as seamless and welded Mechanical Steel Pipe and Tubing, Seamless Steel Pipe, Stainless Steel Pipe and Tubing, we have cut in our warehouse many million feet of Tubular Steel Products.

The nature of our business necessitates both speed and accuracy in multiple cutting to exact lengths required by customers. When we decided recently to install three more 9A MARVEL Heavy Duty Automatic Hack Saw Machines, it was with full knowledge of their efficiency.

We can assure you of our entire satisfaction with their operation and regard them as valuable additions to our equipment.

Yours very truly,

E. D. GIBERSON & COMPANY, INC.

E. D. Giberson
President

Another Tubing Warehouse "Goes MARVEL"

Warehouses that are not equipped with proper sawing machines find that the cutting of steel tubing (especially the stainless types) is a difficult and costly job. But E. D. Giberson & Company, New York, have cut off millions of feet of all types and sizes of steel tubing to accurate lengths, economically and without difficulty, due to the fact that they have long been properly equipped with MARVEL SAWS. And because they have found MARVEL SAWS so trouble-free, so reliable, so economical to operate and so universally suited to all their cutting-off jobs, they have recently added this row of three new MARVEL No. 9A Automatic Hack Saws. With this additional equipment, they have expanded their facilities and can more promptly serve their fast-growing list of satisfied customers with steel tubing of all types and sizes, "cut to customer's specified lengths."

The local MARVEL Field Engineer will be glad to study your range of cutting-off work—whether it be in pipe, structural shapes, bars, or the toughest and largest alloy billets—and will then make recommendations on how you can improve your cutting-off operations to reduce costs and increase man-hour output.

Just write us on your letterhead: "Without cost or obligation on our part, send your local Field Engineer to look over our cutting-off operations."

MARVEL Metal Cutting SAWS
Better Machines–Better Blades

ARMSTRONG-BLUM MFG. COMPANY

5700 WEST BLOOMINGDALE AVENUE "The Hack Saw People" CHICAGO 30, ILLINOIS

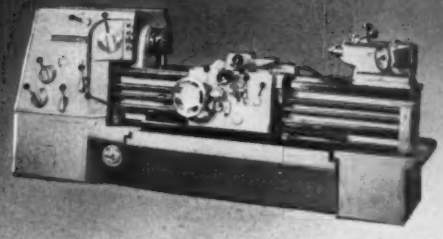
REPLACE With SPRINGFIELD

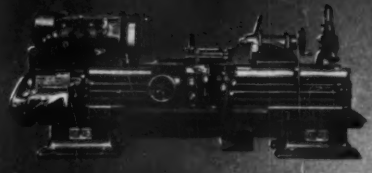
LATHES

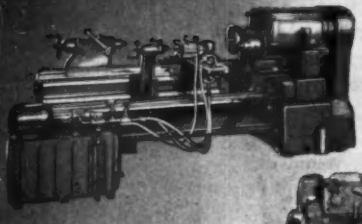
handle a wider range of work—

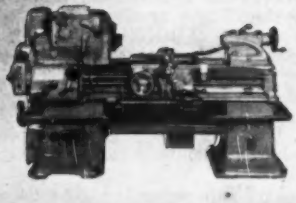
increase [illegible]

lower [illegible] costs









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14" to 32" sizes for heavy manufacturing operations or sensitive tool room work

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SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

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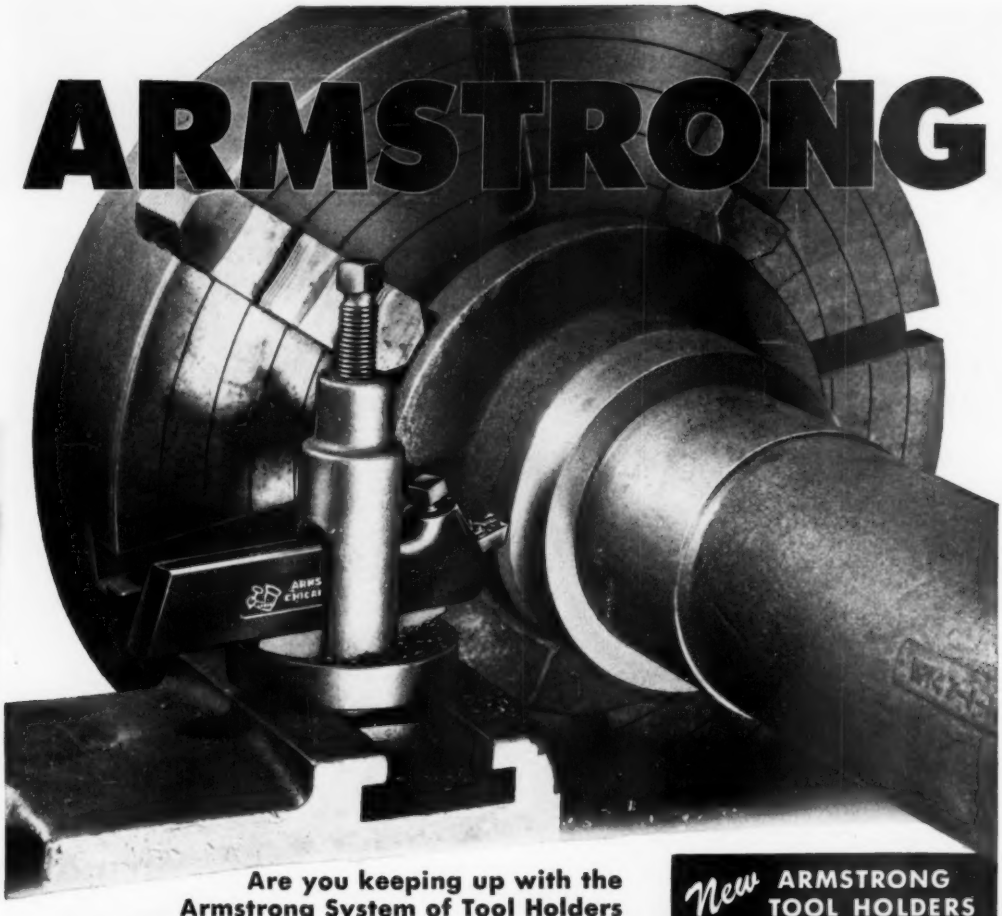
ARMSTRONG



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

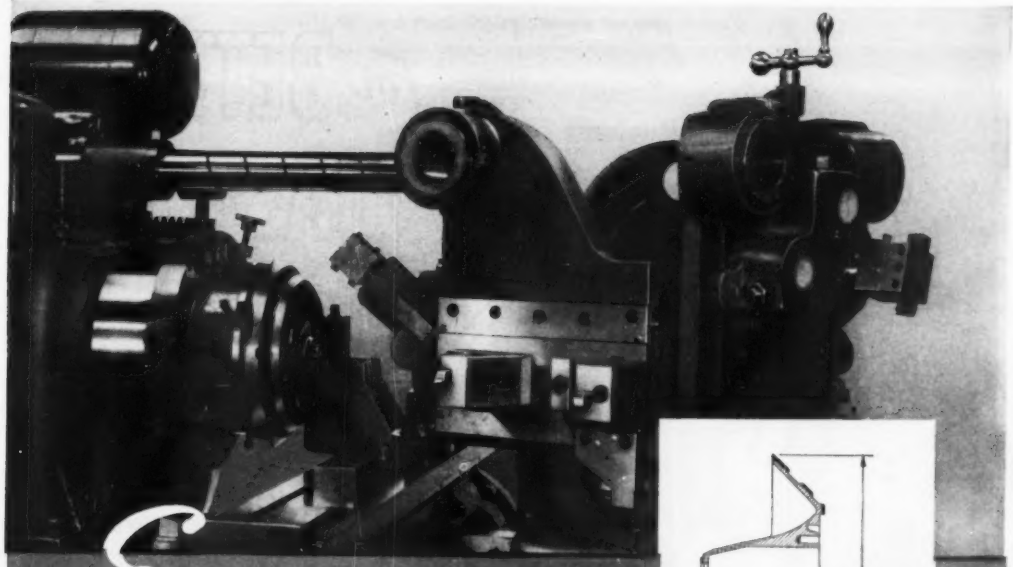
With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-A" Tool Holders for ARMALOY (Cast-Alloy) Cutter-Bits

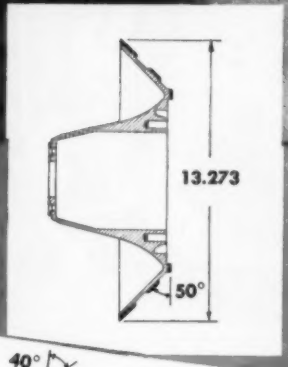
WRITE FOR CATALOG

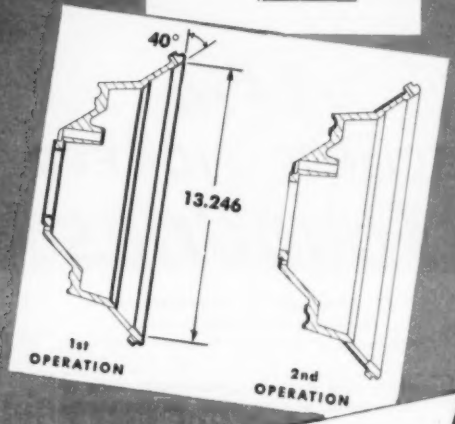
ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.



Experience

IS THE SECRET BEHIND THIS PROFITABLE TOOLING SETUP





P&J Tool Engineers designed this setup for the rough and precision-finish machining of these two rather frail cast iron braiding machine parts.

Note the 50° angular surface on the one part, and the 40° angular surfaces on the other. These angular cuts present no problem to the P&J-designed single point angular slide tool clearly visible in the photograph, while the work is rigidly supported at the rear of the rim to prevent chatter. All other surfaces (indicated by heavy lines in the drawings) are precision finished without distortion — and to the split-thousandth tolerances specified — by this P&J Tooling set up on the P&J 5D AUTOMATIC.

P&J's Experience takes such ordinarily tough machining problems in stride. So why not send your difficult multiple machining jobs to P&J for time-saving, money-saving solutions?

MORE THAN 50 YEARS' EXPERIENCE DESIGNING PROFITABLE PRODUCTION TOOLING FOR...

P&J AUTOMATICS

POTTER & JOHNSTON CO.

PAWTUCKET, R. I.

subsidiary of PRATT & WHITNEY Division Niles-Bement-Pond Company

P&J

For BETTER CASTINGS

from First Design to Final Check . . .

Call on ECLIPSE-PIONEER *Foundries*

ALL Aluminum and Magnesium Alloys
Including the recently developed
Cerium and Zirconium Magnesium Alloys

When you order castings from the Eclipse-Pioneer Division Foundries, you *know* they will be right. Your confidence is justified at *every step* in their manufacture, from first design to final check, for each man is an expert in his field and each operation is backed by more than twenty years' experience. But, this craftsmanship is only part of the picture. As a further guarantee of quality, the Eclipse-Pioneer Foundries use the most modern machines, techniques and testing devices obtainable . . . the entire production line is conveyorized to assure rapid and economical service on all orders. Take advantage of these extras. If you plan to use aluminum and magnesium castings, make it a point to consult Eclipse-Pioneer. Meanwhile, send for Eclipse-Pioneer's "Book of Facts".

PLEASE SEND ME THE ECLIPSE-PIONEER "BOOK OF FACTS" ON MAGNESIUM, ALUMINUM AND BRONZE CASTINGS. AM

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ECLIPSE-PIONEER DIVISION FOUNDRIES
BENDIX AVIATION CORPORATION
TETERBORO, N. J.

Bendix AVIATION CORPORATION

AND PRECISION (±.003")

PLASTER MOLD CASTINGS

Universally aligning. Capacity for radial and thrust loads.
Wide inner ring distributes load over large shaft area.
Lubrication fitting with pressure relief feature prevents excessive grease pressure.
Self-aligning seals effectively keep grease in and dirt out, regardless of alignment.
Spring-locking collar with set-screw clamps bearing firmly on shaft.
Lubricant passes freely into large reservoir to lubricate moving surfaces.
Easily installed by slipping bearing onto shaft and clamping inner ring by tightening two set-screws in spring locking collar.
Sturdy, compact cast housing requires minimum support space, can be positioned on the side of a machine.
CUTAWAY OF SERIES 200 BALL BEARING FLANGED BLOCK
Flanged Cartridge Block
Cartridge Block
Hanger Block
Take-up Block
Floor-type Take-up
Wall-type Take-up
Protected Screw Take-up

By any standard . . .

LINK-BELT builds a bearing block for every purpose

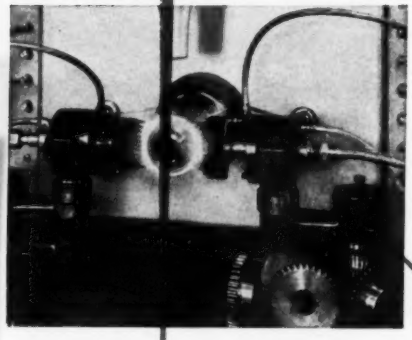
To meet any industrial requirement, Link-Belt builds ball and roller bearings in a complete line of mounting designs. All are made in a wide range of types and sizes . . . all are precision built for top efficiency and dependability. A Link-Belt bearing specialist will show you how the right bearing can be applied to match your exact needs. Or you can get engineering information from Data Book 2550.

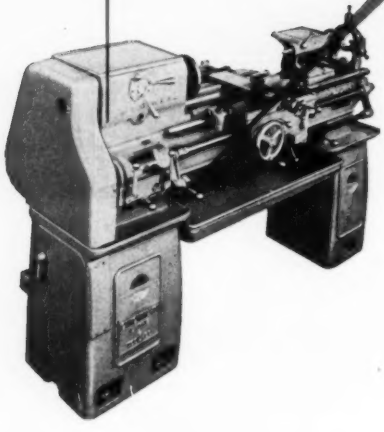
LINK-BELT

Ball and Roller Bearings

LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities. 12,437

flame facts





Flame hardened gears throughout are standard . . . **flame hardened bed ways** are available at small extra cost . . . in Tray-Top light duty all geared head engine and toolroom lathes. Add these plus values to **versatility:** 12 spindle speeds, 48 thread and feed changes, top speeds to 1800 rpm., quickest changeover from English to metric thread chasing . . . **operator convenience:** centralized controls, instant speed selection with direct reading color-match speed selector, dual control levers, "Tray-Tops" on headstock and tailstock for parking tools, mikes, gages, etc. . . . **operator safety:** totally enclosed change gear box, totally enclosed electrical panel, accessible only by opening master disconnect switch, feed levers disengaged in down position . . . **floor space savings:** cabinet legs really have room for chucks, face plates, etc., reduce or eliminate need for separate bench or storage space . . . Add up all Tray-Top's outstanding values and you'll find it your best buy. Swing sizes: 10", 12½", 15", 18". Write for new bulletin.

CINTILATHE

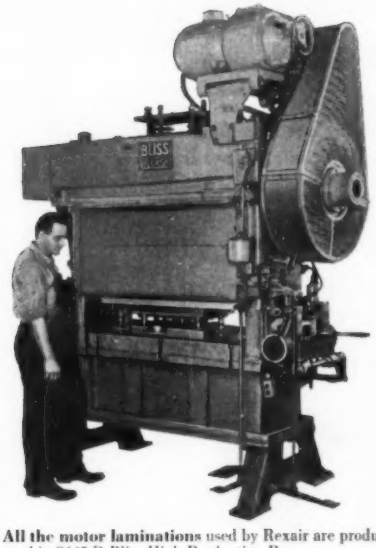
OF OUTSTANDING VALUE

CINCINNATI 9, OHIO, U.S.A. cincinnati lathe & tool co.

Six of the Bliss Inclinables producing the variety of parts for the Rexair Cleaner and Conditioner. All new equipment is Bliss-built.

NEVER A MINUTE'S LOSS IN 2 YEARS

Stamping Rexair Cleaners and Conditioners



All the motor laminations used by Rexair are produced on this #645-D Bliss High Production Press.

"One or Several Copies Are Needed in Any Shop Doing Stamping Work"...*American Machinist*

Completely New

700 Pages • 450 Illustrations

Sections on: Computing press jobs • Selecting proper press • Useful engineering tables • Die illustrations • Complete glossary. Plus a service section for Bliss presses. **$7.50**

E. W. BLISS COMPANY—Handbook Dept., Canton, Ohio

Ten Bliss Inclinable presses and a Bliss High Production press equipped the Rexair Division of Martin-Parry Corporation to meet all stamping requirements on a high-volume, low-cost manufacturing basis. Die cushions were built into several presses to accommodate necessary drawing operations and to give Rexair greater versatility in its press room.

"Since the Bliss presses started operating about two years ago, we've never had a minute's production loss," says Les Johnson, Rexair's plant superintendent. The High Production press delivers an average of 8,600 perfect laminations per hour, running well within its capacity.

Bliss-Marquette Die Cushions are credited by Don Crane, press department foreman, for part of the long die life on the Inclinables producing separators, water pan bottoms and inspection plates. The pneumatic cushions exert a constant pressure throughout the entire stroke, and are used for drawing work that would not be possible with spring cushions, while at the same time eliminating the excessive pressures which cause wear and tear on dies.

Whatever your stamping problems, Bliss engineers can render valuable service in recommending equipment precisely suited to a given set of production conditions.

E. W. BLISS COMPANY, CANTON, OHIO

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

Inspection Plate—22-gauge steel, 6⅞" dia., 1⅝" drawn and formed—400 per hour.

Water Pan Bottom—.024 steel, 10½" dia., 1½" drawn and formed—356 per hour.

Separator—18-gauge aluminum, 4¼" dia., 1¼" drawn and formed—514 per hour.

Fan Shroud (left)—24-gauge aluminum, 5½" dia., 1" drawn and formed—751 per hour.

Eddy Plate (right)—24-gauge aluminum, 5½" dia., 1" drawn and formed—751 per hour.

Motor Laminations—.018 steel, 2" dia., 3¾" dia., average 8,600 hourly production with progressive die.

From a single press for a given job...to a complete press room... **It's Bliss**

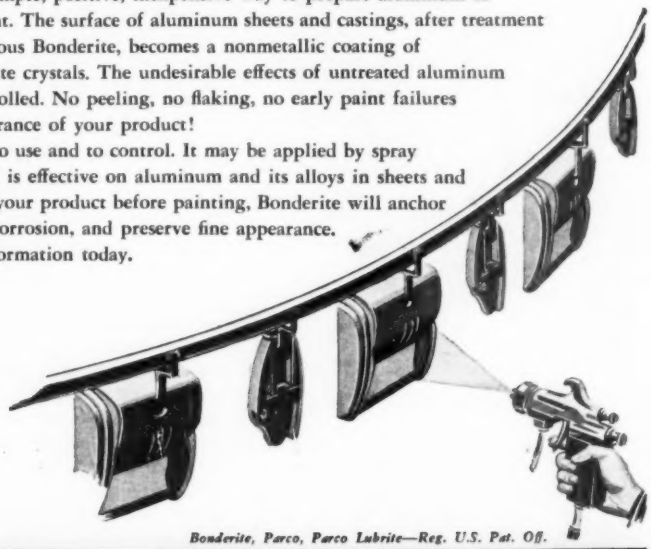
BEFORE YOU PAINT ALUMINUM

Famous corrosion resistant paint base ends peeling and flaking, preserves appearance

Bonderite is the simple, positive, inexpensive way to prepare aluminum to take and hold paint. The surface of aluminum sheets and castings, after treatment with Parker's famous Bonderite, becomes a nonmetallic coating of fine-grain phosphate crystals. The undesirable effects of untreated aluminum on paint are controlled. No peeling, no flaking, no early paint failures to spoil the appearance of your product!

Bonderite is easy to use and to control. It may be applied by spray or immersion, and is effective on aluminum and its alloys in sheets and castings. Used on your product before painting, Bonderite will anchor the paint, retard corrosion, and preserve fine appearance.

Write for full information today.



Parker Products meet government specifications

Available now—a list of government specifications and the Parker Products which meet them. We'll send it free, on request.

Bonderite, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

PARKER — Parker Rust Proof Company

2196 East Milwaukee Avenue, Detroit 11, Michigan

BONDERITE—Corrosion Resistant Paint Base • PARCO COMPOUND—Rust Resistant • PARCO LUBRITE—Wear Resistant for Friction Surfaces

TIPS ON THE TOPS IN TAPS

1 They're the complete line, for every tapping application, in every material

2 They're made in high speed or carbon steel, for best results on every job

3 100% inspected...each tap individually inspected

4 They're Butterfield, of course!

Checking pitch diameters with wires, by the pressure method. Some of the specialized equipment used in Butterfield's 100% inspection.

Hand Taps • Machine Screw Taps
Pipe Taps • Stove Bolt Taps • Pulley Taps
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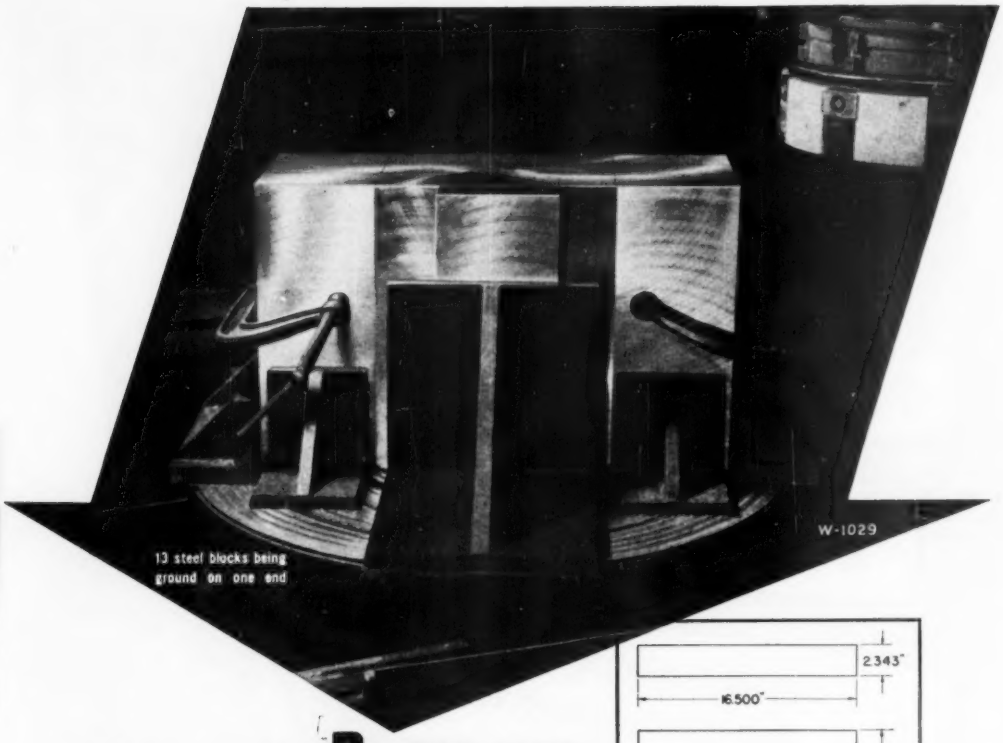
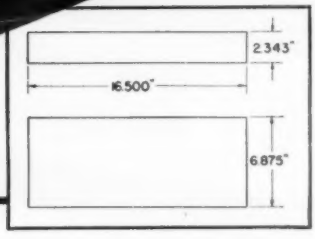
BUTTERFIELD
THE 100% INSPECTED TOOLS
Every Tool Individually Inspected
TAPS • DIES • REAMERS • SCREW PLATES





Put it on the BLANCHARD

√. . . for stock removal

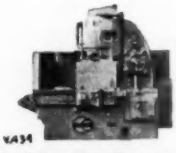
These annealed steel blocks were ground on all 6 surfaces on a Blanchard No. 18 Surface Grinder. Rough size was 16¾" x 7⅛" x 2½". *37.439 lbs. of metal were removed from each piece!*

√. . . for speed

Thirty of these steel blocks were ground on all 6 surfaces in 42½ hours. *This is a floor-to-floor time of only 85 minutes each.* All surfaces were ground square within .002", and flat and parallel.

√. . . for comparison

Let Blanchard grind some sample parts, or give you estimates from prints of your surface machining jobs. A comparison with your present methods may surprise you!

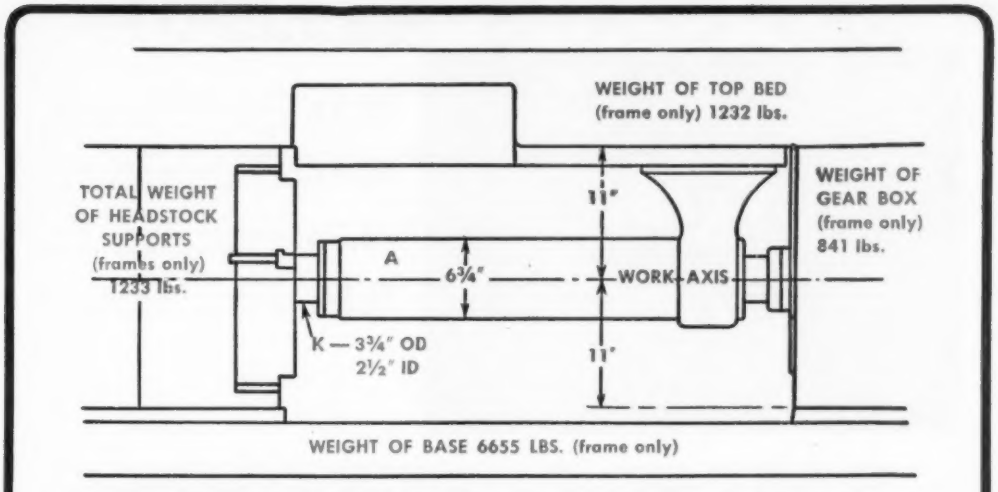


NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



MAKER OF "HISTORIES"

The above drawing illustrates a Tooling Area that has staged many outstanding cases of machine adaptation and performance. Case histories are very useful as examples of machine adaptation, but their blanket use as unqualified proof of dependable performance is not convincing.

Buyers know that varying requirements and conditions of various plants make "buying what the other fellow buys" an unsafe practice. They know that good case histories will result if machine facilities have been properly selected. No plant could long afford to have it otherwise.

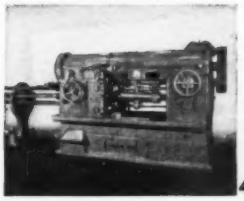
A "top performer" of the 1½" SIX SPINDLE CONOMATIC TOOLING AREA, shown above, is the MAIN END SLIDE. The specific data given tells why:

1. **It has a greater maximum load recommendation and a stronger frame support than the main end slide of any other "automatic".**

   The 272 lb. alloy carburized steel Main End Slide, A, is 33⅝" long, and has a maximum load recommendation of 4800 ft. lbs. Its round surface is machined to close limits. It is supported in nickel iron, split, sleeves on the alloy steel Way, K, with a total bearing of 136.9 sq. ins.

2. **It handles more work; has more adaptable tooling positions, and more selective feeds, than the main end slide of any other "automatic".**

   The 27⅞" tooling-length of the Slide handles shaft jobs up to 18" in length. The 2⅝" swing clearance permits die-head threading to full machine capacity in any, or all, six positions without Slide alteration. Nine pairs of pick-off gears give 68 feed changes for each work spindle speed.



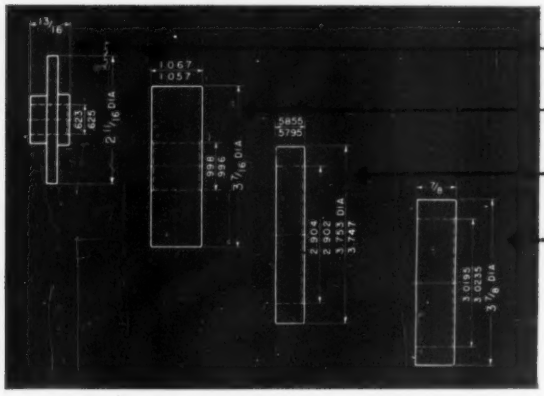
Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Could you use savings like these?



82.9% Material: C-1117 Steel
Acme-Gridley Model M Time: 36 sec.
Time by Previous Method: 3-1/2 min.

82.4% Material: C-1022 Steel
Acme-Gridley Model M Time: 58 sec.
Time by Previous Method: 5-1/2 min.

73.3% Material: C-1117 Seamless Tubing
Acme-Gridley Model M Time: 24 sec.
Time by Previous Method: 1-1/2 min.

74.2% Material: B-1112 Steel
Acme-Gridley Model M Time: 1 min. 33 sec.
Time by Previous Method: 6 min.

These four jobs, done with an average saving of more than 75% of former machining time, are typical of the new Acme-Gridley Model M Single Spindle Automatic's performance.

Eight independently operated slides permit use of the speeds and feeds best suited to each cut, taking full advantage of the latest carbide-tipped tooling methods. You can get the right surface speed for a wide range of diameters through utilization of the three automatic spindle speed ranges.

These are but two of the basic design advantages that make this new Model M Acme-Gridley Automatic your best bet for increased production and lowered costs. For complete details ask for Bulletin M-50.

A metal-working manufacturer must look upon re-equipment as a continuing function. Otherwise, he's on the defensive, competitively speaking—and that doesn't score any touchdowns, goals or runs.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

MUELLER BRASS CO.

600 series a better bearing bronze containing no hard-to-get tin

Four typical parts forged from Mueller Brass Co. "600" series Bearing Bronze.

If you use gears, connecting rods or other parts of bearing metal in your products, it will pay you to investigate Mueller Brass Co. "600" series, a forgeable bronze that *contains no critical tin.* This bearing metal outperforms phosphor bronze and other bearing metals and will save you money in your applications. "600" series bearing metal can be forged into relatively complicated shapes and produces a forging of close-grained homogeneous structure impossible to get in a casting. The forged shape is closer to finished size than a casting and requires less machining. "600" series alloys have a low coefficient of friction, a tensile strength 2½ times greater than cast phosphor bronzes and a high resistance to corrosion. "600" has a 25 year record of outstanding performance on some of the toughest bearing applications. There is a "600" series alloy with the properties to fit your bearing metal needs . . . write today for further facts.

MUELLER BRASS CO.

PORT HURON 18, MICHIGAN

64

Standardize on PRATT & WHITNEY REAMERS

—they have the UNIFORM QUALITY, PRECISION AND LONG LIFE required to meet Today's Critical Needs

1 Stub Screw Machine Reamers
2 Shell Reamers with Spiral Flutes
3 Jig Borer Precision End Cutting Reamers
4 Hand Reamers with Spiral Flutes
5 Blue Helix Fluted Chucking Reamers
6 Carbide Tipped Fluted Chucking Reamers
7 Expansion Hand Reamers with Spiral Flutes
8 Helical Taper Pin Reamers
9 Camlock Adjustable Chucking Reamers with Serrated Blades

"THERE'S NO BETTER-PAYING INVESTMENT THAN THE RIGHT TOOLS FOR THE JOB"

PRATT & WHITNEY
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

LITERATURE AND INFORMATION MAY BE OBTAINED AT ALL P&W BRANCH OFFICES

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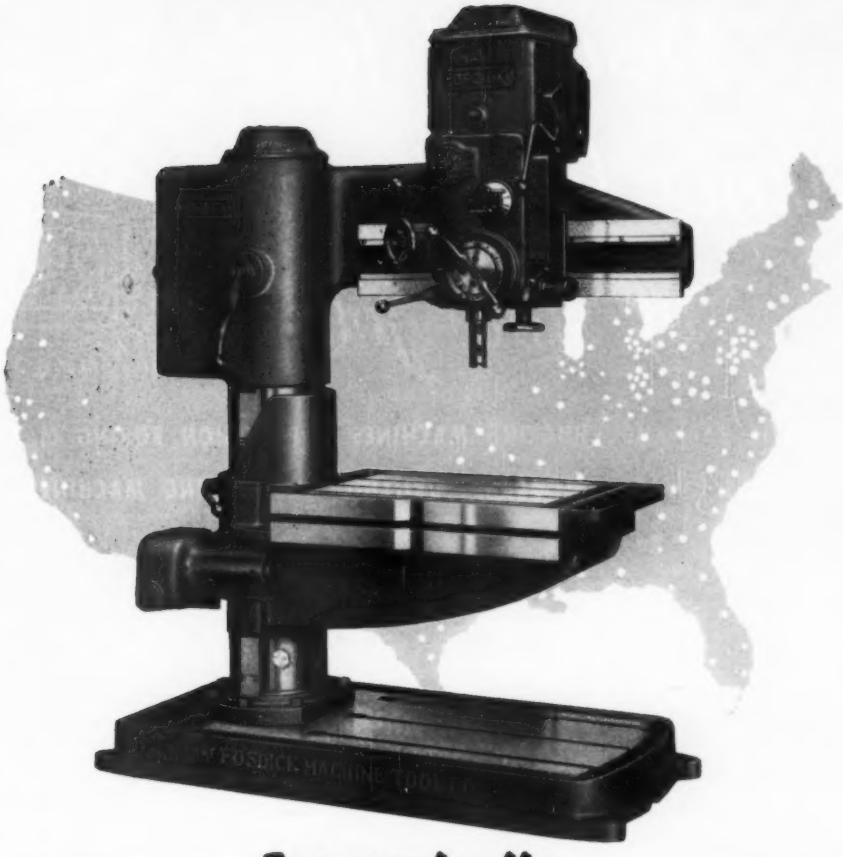


DRILLING HOLES *Economically* ALL OVER AMERICA

Economy of operation, plus increased production, is the by-word of American Industry today. You get both with the FOSDICK SENSITIVE RADIAL.

Because of its unique design which combines sensitive drilling with the flexibility of radial construction, the FOSDICK SENSITIVE RADIAL has become the favorite among economy-minded production men throughout America.

Instead of the conventional design of moving the arm up and down on the column, the FOSDICK SENSITIVE RADIAL has the arm at fixed height and can be swung in a 360° arc. The table which also swings in a 360° arc moves up and down and around a sturdy one piece column. These two features make it very simple to locate the work in any desired position, resulting in a great saving of time.

The head provides nine speeds and four feeds . . . control levers for both feeds and speeds are direct reading and right at the operator's fingertips.

Where, a quantity of holes up to 1½" dia. are to be drilled, the FOSDICK SENSITIVE RADIAL surpasses all other drills.

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO

Designed for making fast work of slow jobs

THE NEW BRITAIN MACHINE COMPANY

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES

LUCAS HORIZONTAL BORING DRILLING AND MILLING MACHINES

NEW BRITAIN

Automatics

THE NEW BRITAIN GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

CARD Spiral Pointed TAPS

Cost no more...yet they're double-checked!

Card Spiral Pointed Taps are thoroughly factory-inspected, of course. But every so often the Pittsburgh Testing Laboratory buys them on the open market, then *re-checks* them—as it does with all Card Taps—and certifies the results.

We do this to make sure that the Card Taps you buy will perform better and last longer. That's why it always pays to specify Card Certified* Taps. They're double-checked for your protection — *yet they cost no more than ordinary taps!*

Card Spiral Pointed Taps are available in carbon steel and high speed steel, cut thread, commercial ground or precision ground. See your nearby Card Distributor.

In Card Spiral Pointed Taps the first few threads are milled at an angle to the axis of the tap and with an extreme rake. The superior cutting action of this feature produces a long, curling chip, which is forced ahead of the tap, eliminating chip clogging. This enables the tap to be made with a shallow straight fluting that greatly increases tap strength and reduces breakage to a minimum.

CARD Quality

TAPS

The Certified Cutting Tools*

*by the Pittsburgh Testing Laboratory

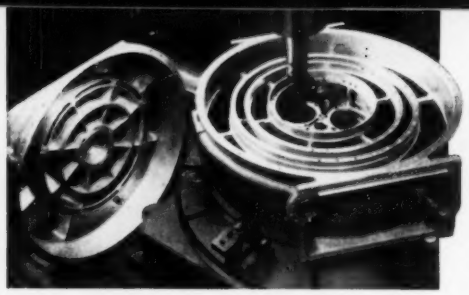
Also makers of DIES • SCREW PLATES
DIE STOCKS • TAP WRENCHES

S. W. CARD

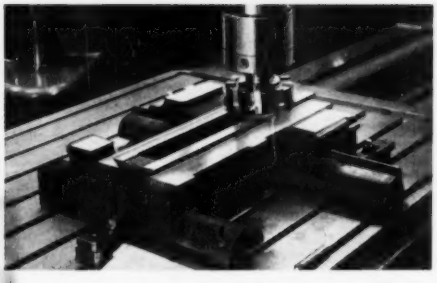
MANUFACTURING CO.

Mansfield, Massachusetts

DIVISION OF UNION TWIST DRILL COMPANY



An optical jig borer with exceptional working range and potentialities



The success met by the SIP Hydroptic-B Jig Boring and Milling Machines of medium size has resulted in an ever-increasing demand for similar machines of larger size.

The new *Hydroptic-7* fills the need and, backed by a unique experience, excels all the previous records in accuracy and production.

Built-in standard scales

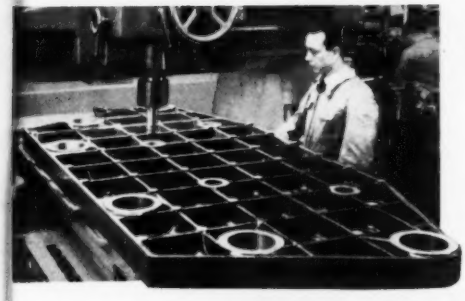
viewed by totally-enclosed micrometer microscopes constitute the basic elements of the measuring system which is unaffected by mechanical stresses and is free from wear.

Exceptionally high productive capacity

in boring as well as in milling operations, will prove invaluable wherever urgent tooling program or an immediate increase in production is at stake.

The *Hydroptic-7* will save annually months of time and assure high returns on the investment.

Working range	55" × 40"
Table top to spindle end	39 3/8"
Free space between uprights	63"
Working speeds (18)	from 40 to 2000 r. p. m.
Spindle quill travel	12"
Boring capacity	9"



SIP

Hydroptic -7-

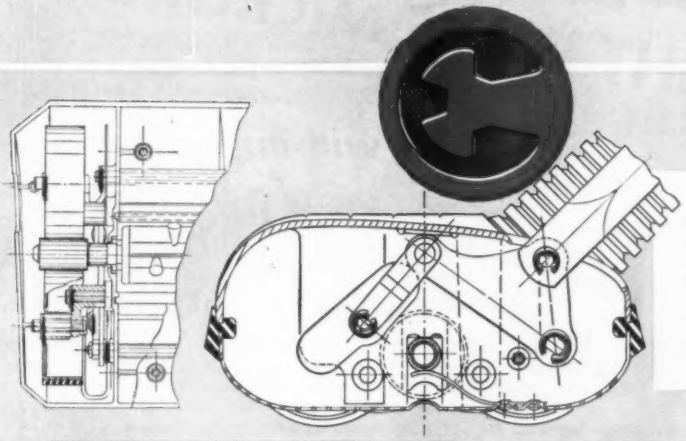
Guaranteed setting accuracy: .0002 in.

AMERICAN SIP CORPORATION

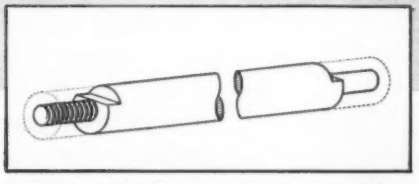
HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N. Y.

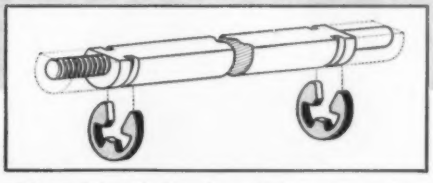
12 TRUARC RINGS SAVE 25% MATERIAL ...50% LABOR COSTS...50% ASSEMBLY TIME



With Waldes Truarc Retaining Rings, assembly in hard-to-reach places is easier, since there are no washers and bulky lock nuts. Smaller shafts can be used. Unit is smaller, lighter, more efficient!



CONVENTIONAL WAY: 2 round rods were required, milled down to D-shape. 4 threading operations to accommodate lock nuts.



TRUARC WAY: Truarc Rings allowed Lewyt Corporation to use 2 stock D-shape rods. No milling . . . no threading—just 2 grooves!

Using 12 Waldes Truarc E Retaining Rings in their new "101" Vacuum Cleaner nozzle brought the Lewyt Corporation, Brooklyn, N. Y. tremendous material and labor savings . . . eliminated 2 milling and 12 threading operations . . . made possible the use of stock extruded D-shaped rods . . . simplified maintenance. And with Waldes Truarc Rings unit is 15% lighter . . . 10% smaller overall!

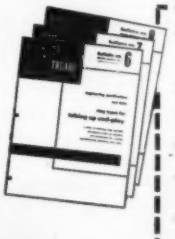
Redesign with Truarc Rings and you too will cut costs. Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better job of holding parts together.

Waldes Truarc Rings are precision-engineered . . . quick and easy to assemble and disassemble. Always circular to give a never-failing grip. They can be used over and over again.

Find out what Truarc Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

Waldes Truarc Retaining Rings are available for immediate delivery from stock, from leading ball bearing distributors throughout the country

SEND FOR NEW BULLETINS



WALDES TRUARC

REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS ARE PROTECTED BY THE FOLLOWING PATENT NUMBERS: U. S. PAT. 2,362,048; 2,420,921; 2,411,761; 2,487,803; 2,467,602; 2,491,308 AND OTHER PATS. PEND.

Waldes Kohinoor, Inc., 47-16 Austel Place AM063
Long Island City 1, N. Y.

Please send Bulletins 6, 7 and 8—giving engineering specifications for all types of Waldes Truarc Rings.

Name_____

Title_____

Company_____

Business Address_____

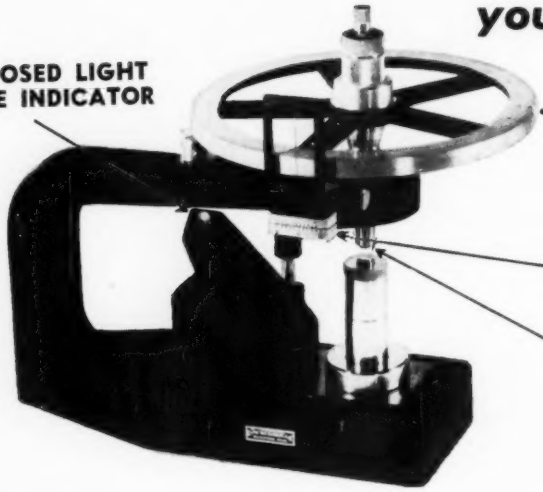
City_____ Zone_____ State_____

678

THE NEW

Van Keuren 0 to 3" LIGHT WAVE MICROMETER

will improve your product . . .



CATALOG AND HANDBOOK No. 34

This 208-page volume represents 2 years research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request.

THE Van Keuren Light Wave Micrometer is an instrument of exceptional merit, proven over a period of 15 years. It has enabled hundreds of High School boys and girls to produce and inspect parts to "Hundred Thousandths" of an inch.

The New 0 to 3" Light Wave Micrometer has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non parallax, vernier index which enables readings to be made to .00001". It has an index lock. It has carboloy tipped anvil and spindle. It is a sturdy, yet sensitive instrument which weighs 17 pounds. It is a portable measuring machine, built for "Sustained Accuracy."

The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision—fast, accurate and profitable.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

Convincing PROOF of MANUFACTURING ECONOMY

Management of Massey-Harris of Canada, are proud of their Low cost production and of the Bullard Mult-Au-Matic with which this has been achieved. Starting with one Mult-Au-Matic as a trial, they now have seven.

A statement from this customer reveals that specifically they have:

Cut total machining cost on all parts, in some instances by as much as 90%.

Eliminated costly material handling.

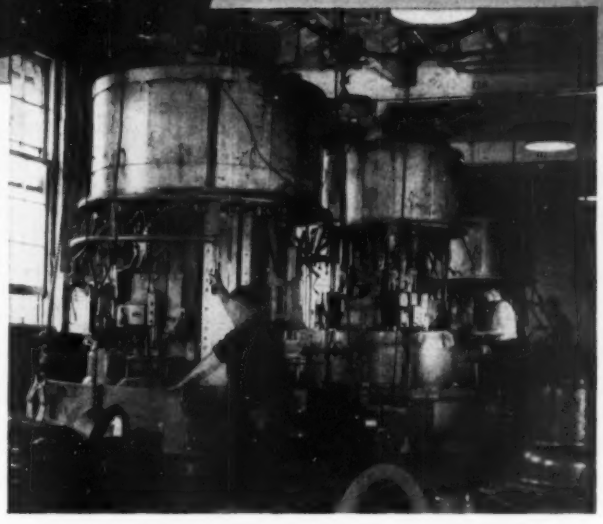
Made possible turning out a much more uniform product.

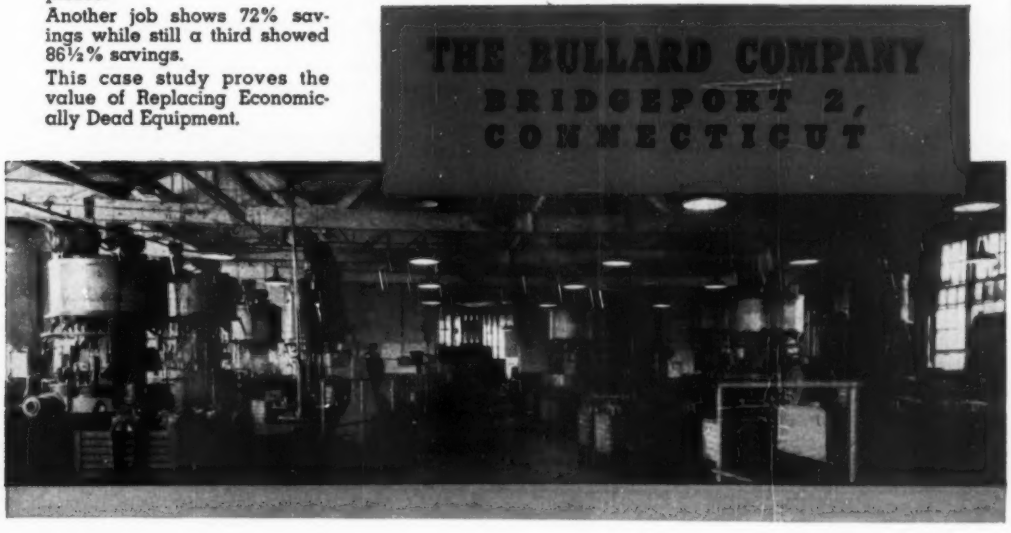
In one case the Mult-Au-Matic has paid for itself in 14 months.

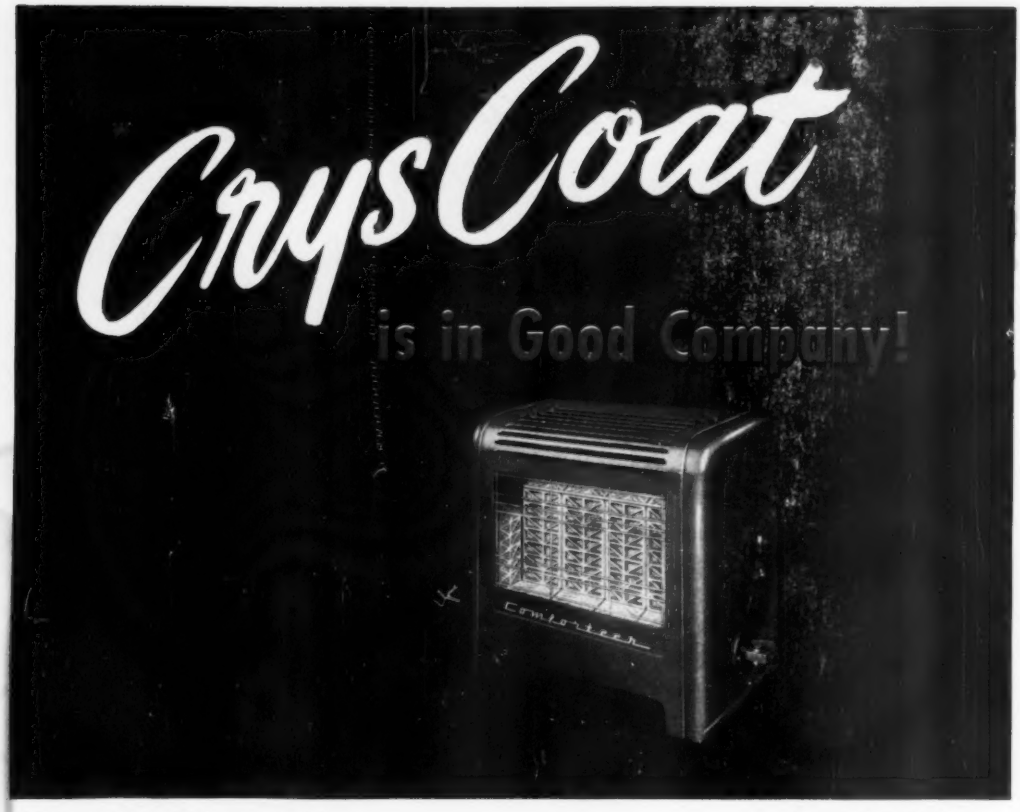
One job shows 6½ pieces per hour against the previous 1½ pieces.

Another job shows 72% savings while still a third showed 86½% savings.

This case study proves the value of Replacing Economically Dead Equipment.







*Prepares Metal Surfaces for Painting

*Patented Material and Process

INLAND "Comforteer" heaters are scientifically designed for heating perfection. They are carefully engineered to distribute abundant heat gently, quickly, evenly throughout the room. The sturdy, steel cabinets of "Comforteer" heaters are CrysCoated before painting to assure perfect paint adherence and to prevent under-paint corrosion if ever finish is accidentally injured.

The Oakite *CrysCoat* Process may be just what you're looking for. With minimum equipment . . . in minimum time . . . at minimum cost you can (1) clean metal surfaces and condition them for painting; (2) improve the adhesion of paint to metal; (3) prevent corrosion before metal is painted; (4) localize corrosion under paint if finish is broken.

The Oakite *CrysCoat* Process Offers These Extras:

1. **Eliminates operations . . . uses less equipment**
2. **Cuts operating time**
3. **Uses less chemicals for cleaning and conditioning**
4. **Reduces heating costs**
5. **Saves cost of expensive acid-proof tanks and equipment**
6. **Saves cost of frequent descaling and desludging**
7. **Drag-out costs are less because of low original cost of solution**
8. **Saves paint**
9. **Cuts cost of rejects caused by rusting before painting**

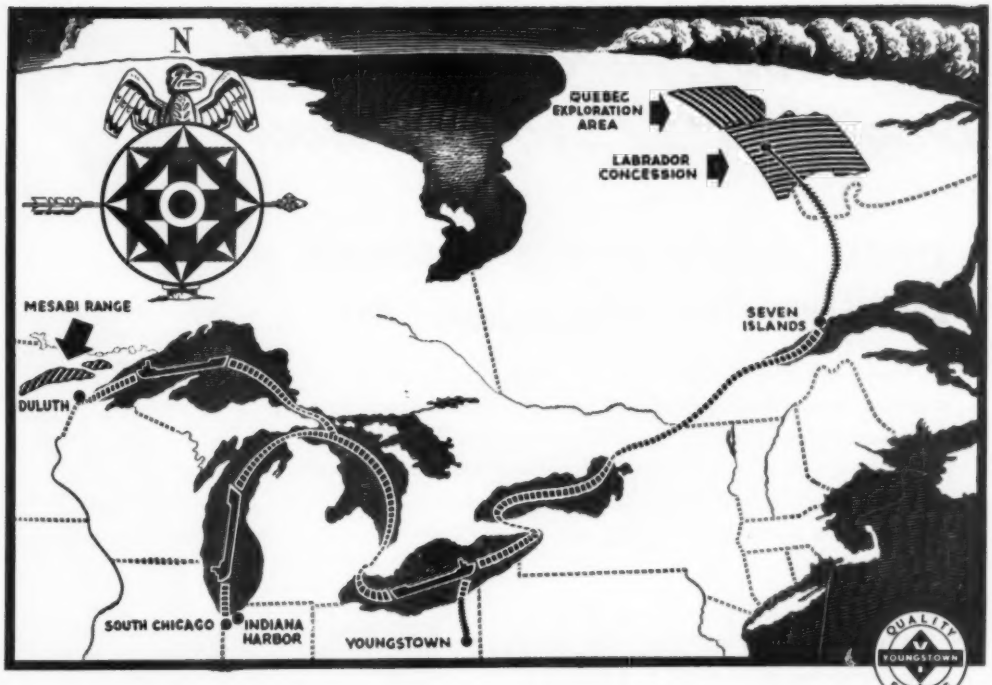
FREE . . . illustrated folder describes the Oakite *CrysCoat* Process for use in before-paint-treatment of steel, aluminum sheet and castings, zinc die castings and galvanized surfaces. If you are engaged in the fabrication of civilian goods or the speedy production of defense orders—send for Folder F7542.

OAKITE PRODUCTS, INC., 28A Thomas St., NEW YORK 6, N. Y.
Technical Service Representatives in Principal Cities of U. S. & Canada

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE



Mister, can you spare Half a Billion Dollars?

ONE half a billion dollars may seem like pin money compared to the sums mentioned for our national finances.

But it is more than three dollars for each man, woman and child in the United States. It is more than the entire steel industry earned in the "dreadful decade" from 1930 to 1939. It's more than America spent to win two wars--the War of 1812 and the Mexican War, combined.

Approximately one half a billion dollars is the estimated sum that a group of steel and mining companies, one of which is The Youngstown Sheet and Tube Company, is investing to guarantee future iron ore supplies for America. In the Mesabi iron range of Minnesota, development projects are under way which will produce millions of tons of iron concentrates from taconite. In Labrador and Quebec, a vast deposit of high grade ore is being developed. Plans include building a 360-mile railroad into the wilderness to ore docks on the St. Lawrence River.

Where does this money come from? From an unnoticed addition to our national debt? From "extra nickels" tucked away in the Federal budget? From more taxes levied on every citizen's income? *Certainly not!* Development of these ore reserves will be financed by each participating Company asking its shareholders to share in its tremendous cost.

America, in peace or in war, is served--now --and for generations to come. This is free enterprise. This is the system that created America from a wilderness and is the only sure way to keep it vigorous and strong.

Scrap Metal is Critical Again

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

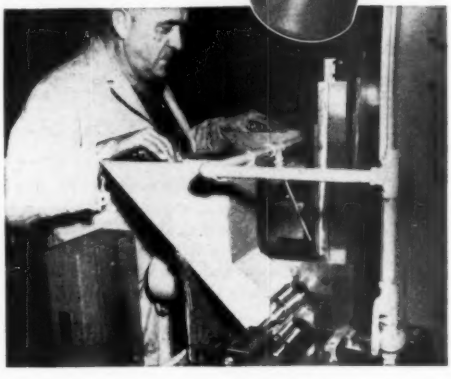
Continuous, Automatic Cycle produces 1150 parts per hour!

TYPICAL EXAMPLE OF HIGH PRODUCTION ENGINEERED THE *American* WAY

To broach radius notches in automotive piston pins, American engineers designed a *completely automatic* two station fixture featuring *continuous cycling*. Each station broaches two parts. Installed on an American T-4-24 Broaching Machine, equipped with a special work table, this fixture permits broaching four parts simultaneously . . . produces more than 1150 parts per hour.

SIX AUTOMATIC OPERATIONS ENGINEERED IN CONTINUOUS CYCLE FIXTURE

The operator has only to keep the gravity-type loading hopper filled with parts. A transfer pusher pushes two parts at each station into position where they are hydraulically clamped in V nests. The main slide starts down broaching the four parts simultaneously. At the end of the stroke the transfer pushers push the part into a chute in the center of the machine where they are ejected. The transfer pushers and broaches return to the starting position and the cycle repeats. All operations are electrically interlocked.



SOLVE YOUR BROACHING PROBLEMS THE *American* WAY

Continuous, automatic cycling is only one way that American engineers help manufacturers get high production. Perhaps an American-engineered installation will increase production in your plant. To get American's recommendations send a part print or sample and hourly requirements.

AMERICAN — *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

When the chips are down

...who's your standby?

YOUR industrial distributor*, of course. He is your nearest, quickest, surest source of supply.

Who else offers a concentrated supply of so many manufacturing requisites? Who else is more likely to know where and how to obtain scarce or sorely needed tools, machines, supplies, parts, accessories, etc.? Who else can do more to help you save time, conserve equipment, keep manpower on the go?

These are critical times. You need your industrial distributor more than ever — to make available items you may require sooner or later, but which would tie up a lot of capital to warehouse yourself.

You need him to relieve you of the headaches of having a lot of scattered direct-buying contacts. They can cost you much in time and effort. You need him to expedite purchase orders and deliveries.

Also . . . your industrial distributor has up-to-date information that is often invaluable to hard-pressed production heads — especially in selecting the best tools or equipment for different manufacturing operations.

Take files: With a vast assortment of existing regular types, cuts and sizes — and scores of special types for special purposes or materials — your distributor's knowledge of *The right file for the job* is of incalculable assistance on both exacting and mass-production work.

Marketing through distributors is a policy that has made Nicholson products obtainable and preferred by the largest host of file users under the sun.

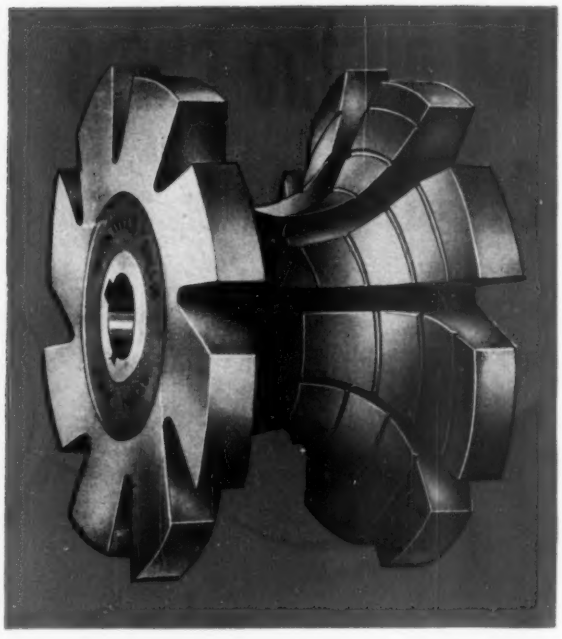
NICHOLSON FILE CO. • 29 Acorn St., Providence 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON FILES *FOR EVERY PURPOSE*

You get more duplicate parts... with

UNION

Form Cutters



MADE OF HIGH SPEED STEEL, Union form cutters are designed to cut with high accuracy within commercial limits. Where even greater accuracy is required, we are prepared to grind form cutters to much closer limits.

UNION FORM CUTTERS, as the name implies, are made to a certain outline or shape, for the production of parts which shall be duplicates, regardless of the number produced. Since they are ground on the face of the tooth, their form remains unchanged by repeated sharpening — when properly done — so that every piece milled during the life of the cutter will be a duplicate. And since, like all Union tools they are built to give extra-long service life, you'll find that Union form cutters are your surest bets for maximum production of duplicate parts with a single cutter — and for greatly reducing milling expenses in this type of operation.

FORM AND PROFILE CUTTERS IN GANGS

Many pieces now machined in successive stages may be more economically handled in one operation, using the proper gang of form cutters. Or, form cutters may be combined with plain mills, side mills and half side mills to finish the work in one set-up. We will be glad to suggest the proper assembly of cutters on receipt of your blueprint.

no other form cutter will outperform a **UNION**

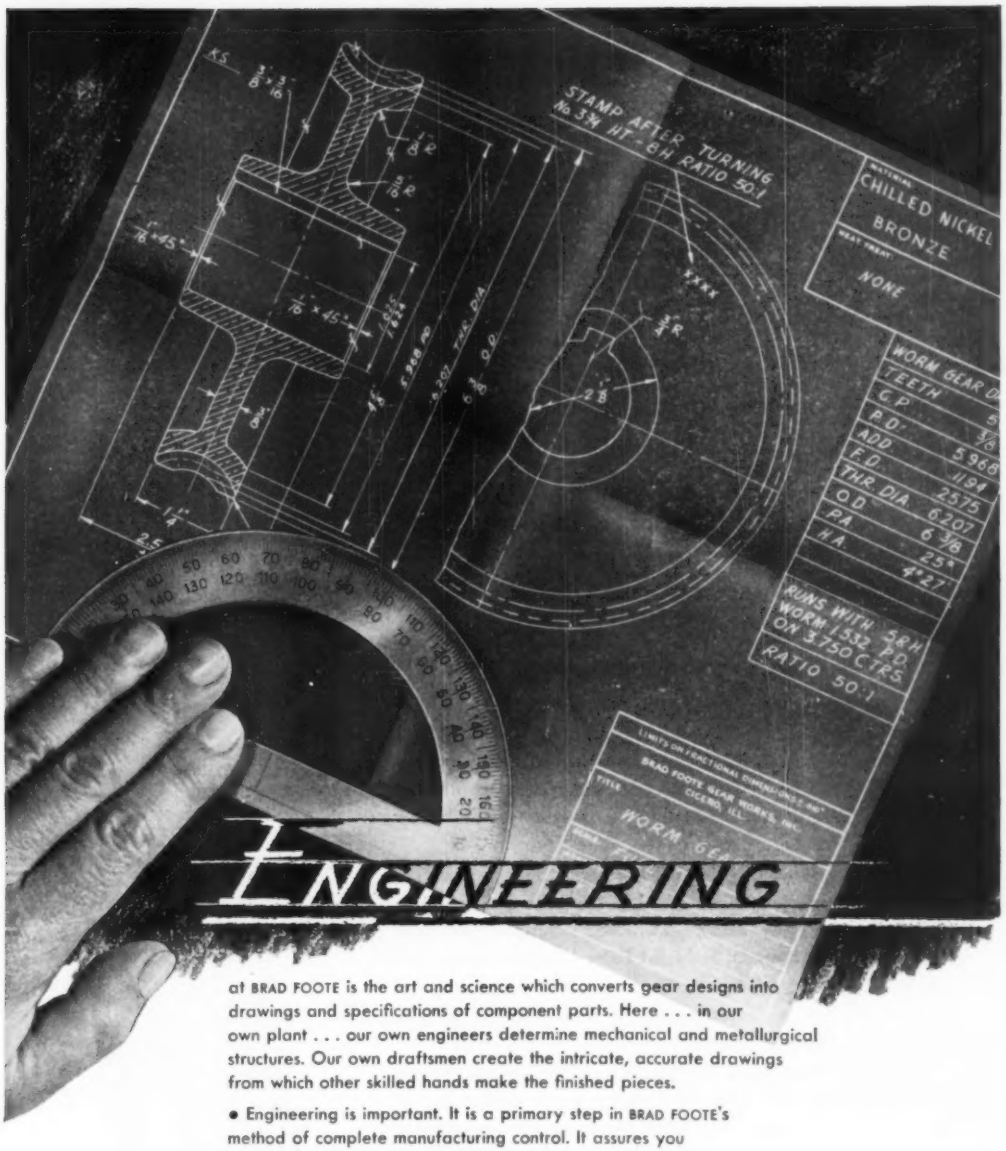
contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under "Drills, Twist".

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Milling Cutters · Gear Cutters · Twist Drills · Hobs · Reamers · Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.



at BRAD FOOTE is the art and science which converts gear designs into drawings and specifications of component parts. Here . . . in our own plant . . . our own engineers determine mechanical and metallurgical structures. Our own draftsmen create the intricate, accurate drawings from which other skilled hands make the finished pieces.

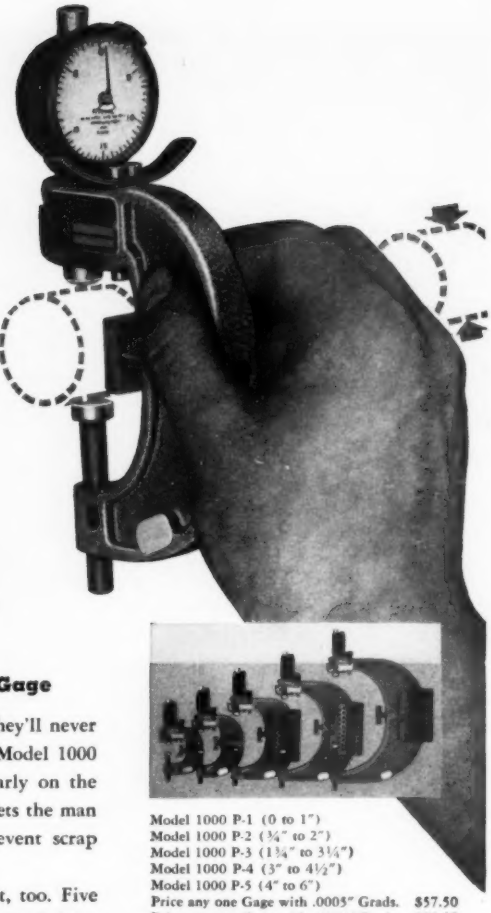
• Engineering is important. It is a primary step in BRAD FOOTE's method of complete manufacturing control. It assures you of gears which will perform satisfactorily . . . when used in your shop or on equipment you sell to others.

• This engineering service we give our customers is another reason why we can say—*"No one shares our responsibility."*

BRAD FOOTE GEAR WORKS, Inc.

BIshop 2-1070 • OLympic 2-7700 • 1309 South Cicero Avenue
Cicero 50, Illinois

Try This for SIZE!



Model 1000 Series Indicating Snap Gage

Let your machine operators "try this for size" and they'll never go back to old-fashioned, fixed-type gages. Federal Model 1000 Series Snap Gage shows dimensional variations clearly on the Dial — not just "go, no-go". This Indicating Gage lets the man at the machine see how he's doing so he can prevent scrap BEFORE it happens.

Model 1000 Series Gages are easy on your budget, too. Five sizes cover the complete range of O.D.'s from 0 to 6". *Each Gage is complete in every detail* — including adjustable backstop, tungsten carbide contacts, full-sized Federal Dial Indicator, and (in 3 larger sizes) insulated grip. Model 1000 Gages feel like conventional "go, no-go" gages, handle like conventional gages, and are even easier to adjust for size.

These gages have gained widespread and enthusiastic acceptance in the very short time they've been on the market. It will pay you to use Model 1000 Series Gages in your production department. Write for complete details, today. FEDERAL PRODUCTS CORP., 1324 Eddy Street, Providence 1, R. I.

Model 1000 P-1 (0 to 1")
Model 1000 P-2 (¾" to 2")
Model 1000 P-3 (1¾" to 3¼")
Model 1000 P-4 (3" to 4½")
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Price any one Gage with .0005" Grads. $57.50
Price any one Gage with .0001" Grads. $75.00
Larger sizes special

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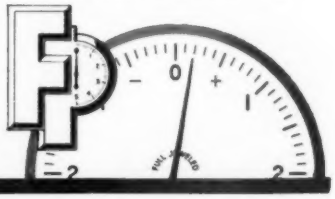


Checking valve bodies for uniformity of wall thickness.

Inspecting welding fittings for wall thickness at Tube Turns, Inc., Louisville, Kentucky.

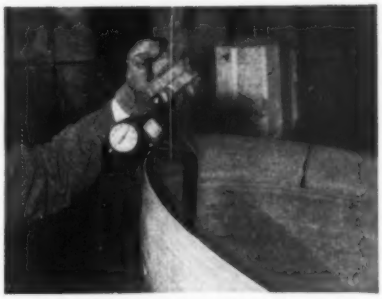
FEDERAL MODEL 49...

THE "Educated" CALIPER GAGE

Don't mistake this for an ordinary Caliper Gage. Federal Model 49 is a direct-reading instrument complete with Dial Indicator. You can use it either as a comparator or as a measuring tool to determine the dimension of a part. Model 49 is light and handy . . . designed for speed and convenience . . . available either as a stock, catalog gage or with special jaws for special jobs.

Dimensions you might let go without checking — where tolerances aren't too tight, or where the dimension is hard to reach — can now be positively and profitably checked by Federal Model 49. This fast-acting, easy-working gage has a knack for getting into close quarters, and showing the actual dimension all in one simple operation.

Use Federal Indicating Caliper Gages to inspect patterns, cores, castings, forgings, tubing, shells, bottles, plastic parts, pipe elbows, valve bodies, and irregularly formed shapes of any description. Model 49 (for outside dimensions) and Model 149 (for inside dimensions) are graduated in .010" or 1/64". Send for complete information and price — including, if possible, blueprint showing dimension you want to inspect. FEDERAL PRODUCTS CORPORATION, 1126 EDDY STREET, PROVIDENCE 1, R. I.



Inspecting wall thickness of a spun bowl.

Model 49 measuring inside diameter.

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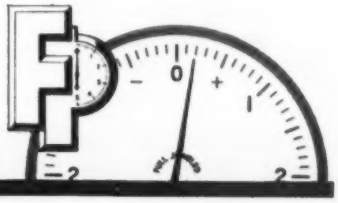

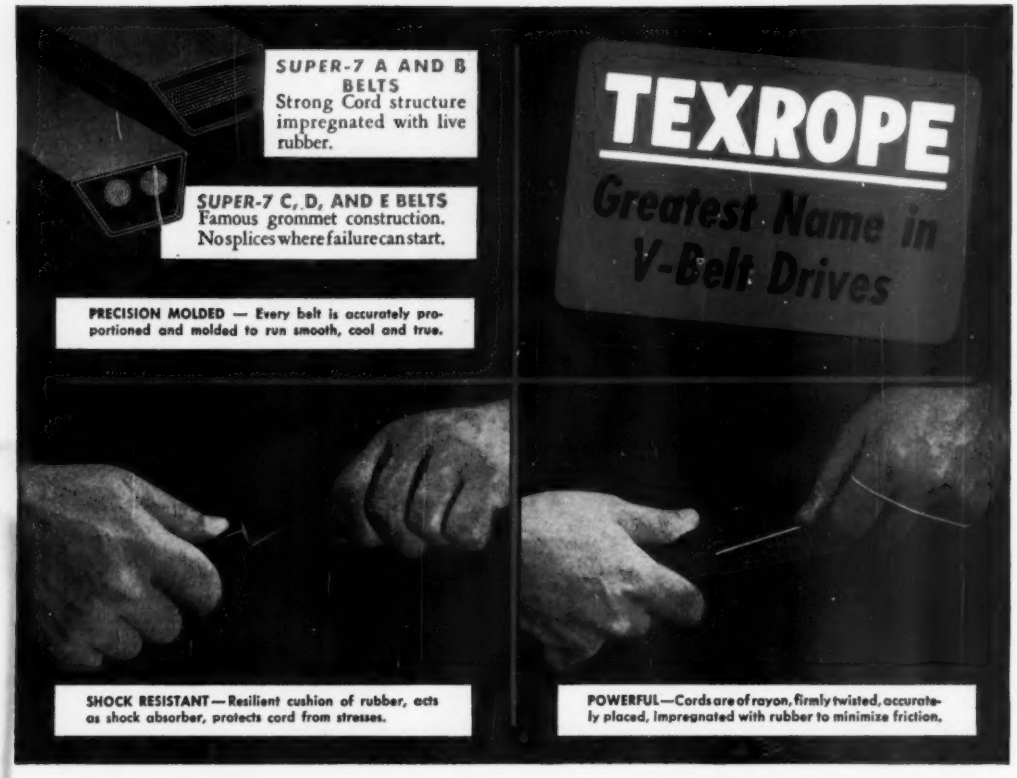
SUPER-7 A AND B BELTS
Strong Cord structure impregnated with live rubber.
SUPER-7 C, D, AND E BELTS
Famous grommet construction. No splices where failure can start.
PRECISION MOLDED — Every belt is accurately proportioned and molded to run smooth, cool and true.
TEXROPE
Greatest Name in V-Belt Drives
SHOCK RESISTANT — Resilient cushion of rubber, acts as shock absorber, protects cord from stresses.
POWERFUL — Cords are of rayon, firmly twisted, accurately placed, impregnated with rubber to minimize friction.

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Greenfield, Massachusetts

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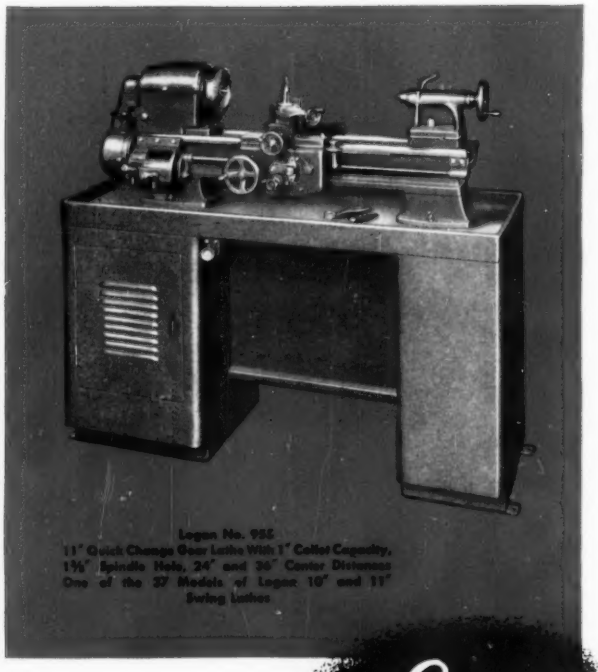

Logan No. 952
11" Quick Change Gear Lathe With 1" Collet Capacity, 1⅜" Spindle Hole, 24" and 36" Center Distances
One of the 37 Models of Logan 10" and 11" Swing Lathes

THESE LOGAN CHARACTERISTICS WILL HELP YOUR PRODUCTION

CAPACITY . . .
With 1" collet capacity, 11" swing, 1⅜" spindle hole and center distances of 24" and 36", Logan Lathes have the size to handle substantial work.

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Less than .0005" spindle runout 12" from the bearing . . . two V-ways and two flat ways precision ground to within .0005" variation . . . these are typical Logan Lathe construction tolerances.

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The Logan Lathe gives you spindle speeds of 45 to 1500 rpm with no bearing adjustment. A complete line of accessories further equips these versatile tools for every type of lathe operation.

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With its ball bearing mounted spindle, its self-lubricating bronze bearings at vital wear points, and its rugged overall construction, the Logan Lathe retains its accuracy and dependability under constant use.

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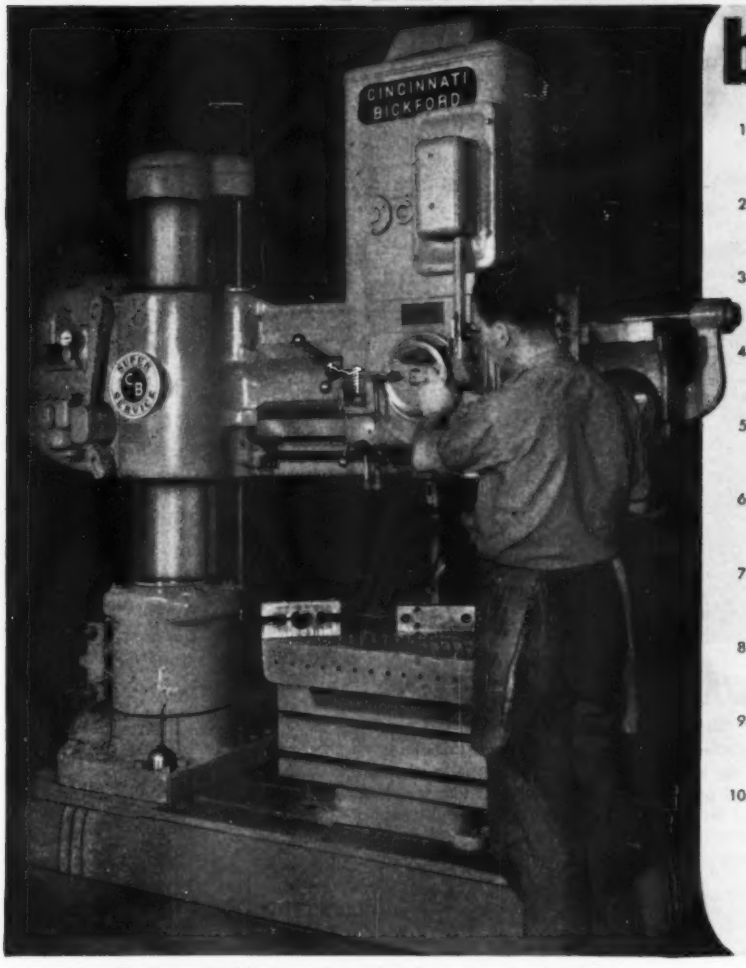

because

1. Controls are all centralized at the head —
2. All 36 speeds and 18 feeds are in the head —
3. Instant spotting with power rapid traverse —
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7. Positive feed clutch controlled with finger tip ease —
8. Drive from motor to spindle is anti friction mounted —
9. Automatic filtered oiling driven by constant speed pump —
10. Selective sliding gears are used throughout —

Job — The Cincinnati Bickford Super Service Radial with 4' arm length 11" diameter column is at the Richmond Manufacturing Company, Lockport, N. Y. — drilling and reaming 2-¼" holes 3" deep. They say, "This machine is very rapid and easy to handle and is two to three times faster than the machine previously used on this job."

Equal Efficiency of Every Unit Makes the Balanced Machine

Good judgment in selecting the proper machines, tools, and fixtures will consistently produce the best manufacturing results. Our CUSTOMER PRODUCTION ENGINEERING SERVICE in the metal drilling field represents the collective experience of many years (since 1874). Make your problems ours - - let us show you a profitable Radial or Upright Drill production application. Your most urgent production problems warrant our immediate attention.

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RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES
Radials 7½" dia. col., 2½" arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
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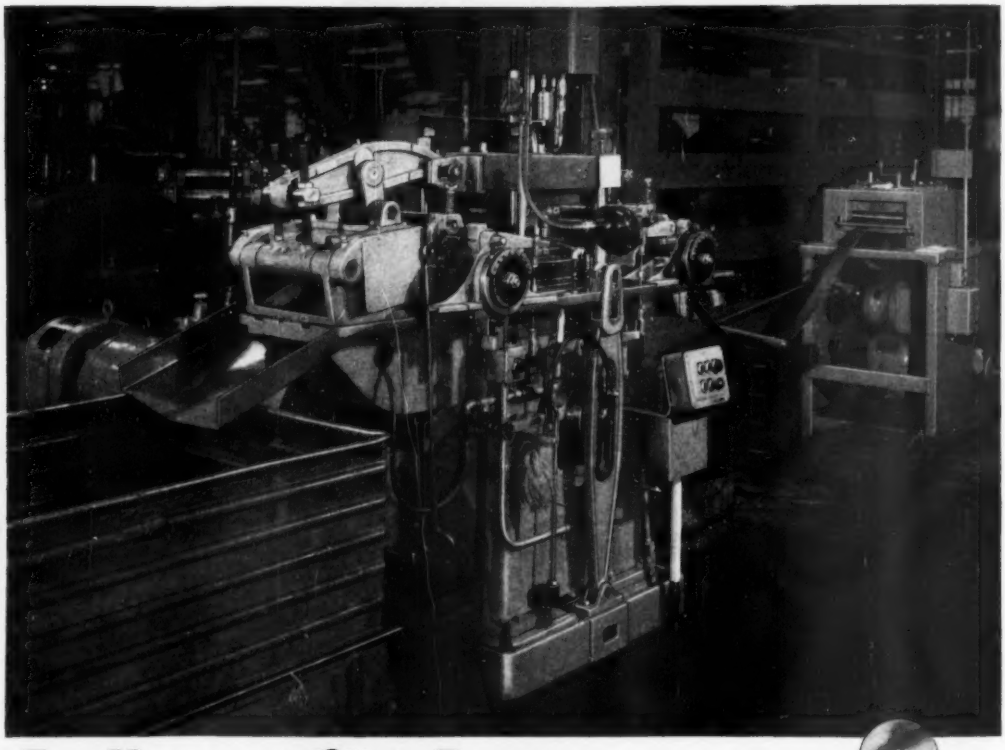
THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.



For National Cash Register which uses three sizes of Henry & Wright Dieing Machines to produce 310 different parts. Production rates range from 400 strokes per minute on a 25-ton machine to 80 strokes per minute on a 75-ton machine, with one or more completed parts produced per stroke. You can't beat them for long die life, or versatility. Remember this: because of their unique, revolutionary design, only Henry & Wright Dieing Machines give you both high speed and long die life. It's an unbeatable combination.

Only the best is

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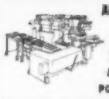

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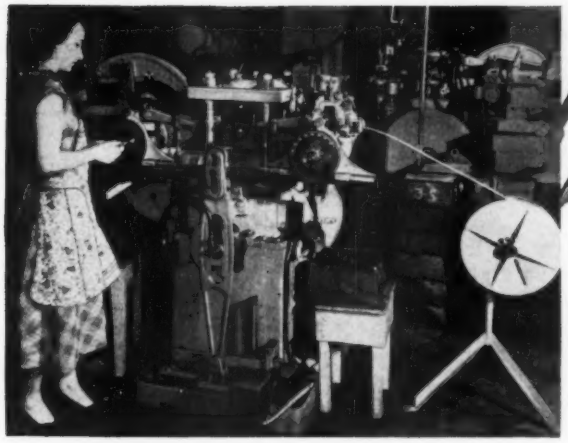
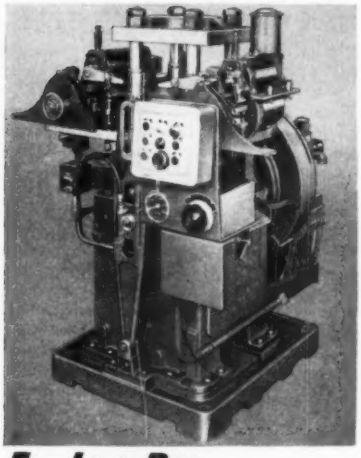
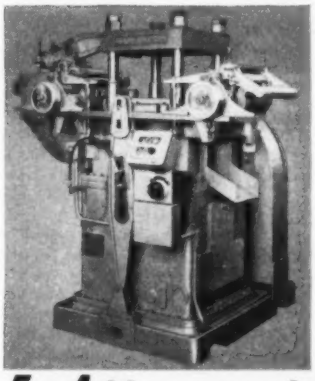


For The Esterbrook Pen

Company which, from the start, has used H. & W. Dieing Machines to produce a wide variety of components for its modern line of fountain pens. Esterbrook selected H. & W. Dieing Machines because of rigidity of lower platen and four-post guide — and their versatility. Stainless steel clips shown here are produced in combination dies which blank, form and mark.



For Link-Belt Company, which uses Henry & Wright Dieing Machines to produce parts for power transmission chain. Here is additional proof that you can depend upon H. & W. machines for speed, precision and sustained efficiency in the production of metal stampings.



For Addressograph-Multigraph

Corporation where complete-per-stroke production on Henry & Wright Dieing Machines keeps production rates high and costs low. Leading companies know they can get the performance they need with Henry & Wright machines.

good enough

FACT PACKED CATALOG
Complete descriptions of all Henry & Wright Dieing Machines. Write: Henry & Wright, 482 Windsor St., Hartford 5, Conn.

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Wickman Steel-Bonded Diamond Wheels

practically indestructible with extra long life. Diamond particles stay in place until completely worn. Finish tools better for longer tool life.

Wickman Resinoid-Bonded Diamond Wheels

for faster and freer carbide cutting and less frequent wheel dressing.

Wickman Chip-Breaker Diamond Wheels

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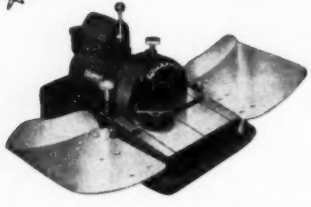
Complete facts in free 52-page catalog.

Grinding with Diamond or Abrasive Wheels is

☆FAST! ☆ECONOMICAL!



on the Wickman GF-2-A

With 1 HP reversible motor and impeller-type 12 gph coolant pump, this heavy bench grinder delivers fast, economical grinding with both silicon carbide abrasive wheels and Wickman steel-bonded diamond wheels. Wheel guards and splash protectors, three position table for wheel wear adjustment, plus a protractor slot for angular grinding, make this the ideal grinder for all off-hand grinding around the shop.

Delivery From Stock. Send for bulletin.

THE Wickman MANUFACTURING CO.
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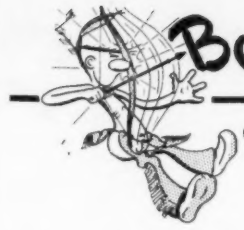


Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

More on High Speeds

I have read every one of your articles dealing with high-speed machining.

As you know, it is only in recent years that the machine-tool industry actually really caught up to carbides in the way of practical speeds. Now that machines are designed largely for carbide tools at so-called "normal" carbide speeds, we could do quite a bit of experimenting with such machines using steel tools—and it wouldn't be too surprising to discover that what we had formerly considered limiting speeds for steel tools were not limiting speeds at all as far as the tools themselves are concerned. The ability to use HSS tools at higher speeds than we formerly thought possible can be a result of such factors as:

1. The ability of machines themselves to take the gaff
2. Greater smoothness of the newer machines at the higher speeds
3. Increased knowledge of tool-grinding practice derived from carbide experience now applied to steel tools, etc.

But when we start talking about still higher speeds—boosting the carbide speed—we are up against the same limitations as the HSS guy was, back when the machines were built for HSS primarily.

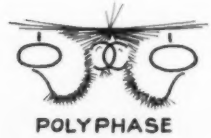
Sure, we can do some experimenting on standard machines souped up and speeded up. But will that give us a true picture? Experience so far would indicate that it does not necessarily do so. Even where they have been doing a lot of experimenting along these lines, they are quite frank to admit if you pin them down that so far they haven't anything they can apply on a "production" basis. The results are too inconsistent.

What causes these inconsistencies? Could it be that a redesigned machine with different basic vibration periods would eliminate them? Would the development of such a machine be worth-while on such a gamble? Could it be that periodicity of work-pieces with different amounts of stock to remove (different harmonically) may be the clue?

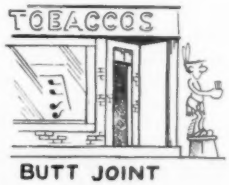
This business of synchronous vibration of machines; machine parts such as toolholders, centers and fixtures; or the work itself certainly seems something worth investigating, particularly when it comes to carbide tools. I don't have to tell you that high-frequency vibration is just

GRINETICS

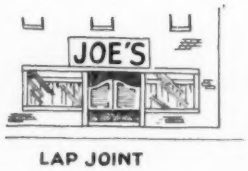
BY D. G. SMITH



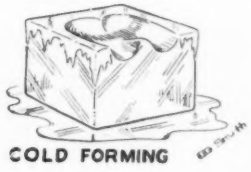
POLYPHASE



BUTT JOINT



LAP JOINT



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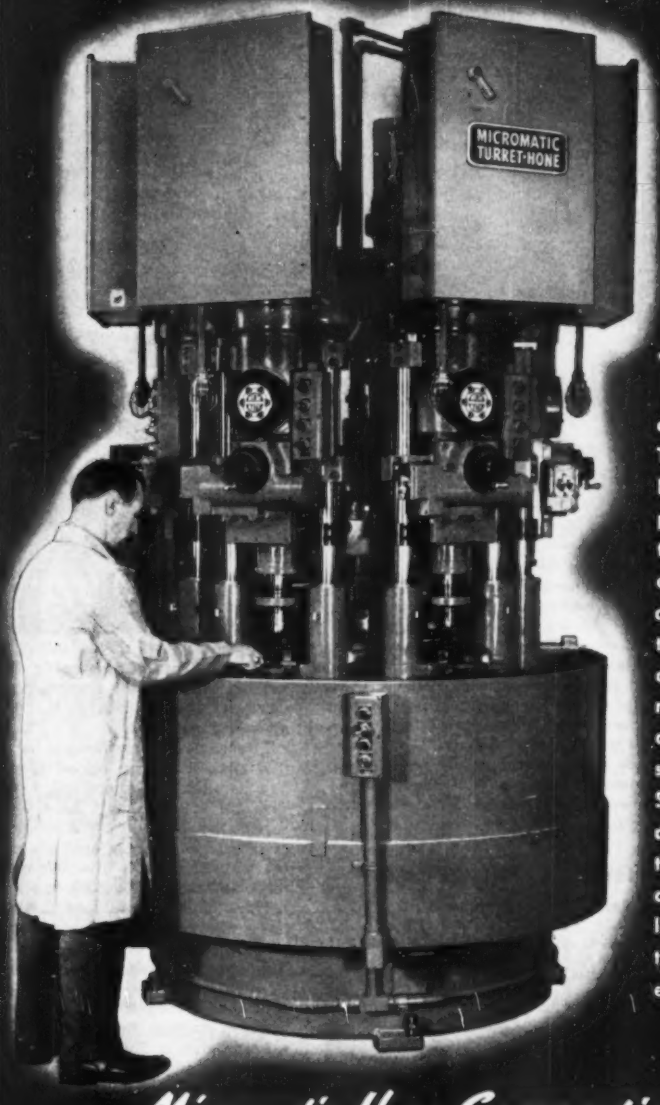
NEW *High Production • High Precision* TURRET • HONE



SIX MICROHONING UNITS
One Machine
One Operator

THIS new model 736-6 TURRET-HONE finishes a part every five seconds. The operator unloads and loads the fixtures as they pass the control station. As the loaded fixture leaves the control station it automatically lifts into position, the tool starts rotating, reciprocating and expanding. The machine rotates continuously. When the part is "to size" the automatic MICRO-SIZE control stops the tool and drops the fixture. As the fixture passes the operator again, a new part is loaded and the cycle continues. This is repeated on each unit.

Micromatic Hone Corporation 8100 SCHOOLCRAFT AVENUE DETROIT 4, MICHIGAN

District Field Offices: 1323 So. Santa Fe., Los Angeles 21, California • 614 Empire Building, 206 So. Main St., Rockford, Illinois
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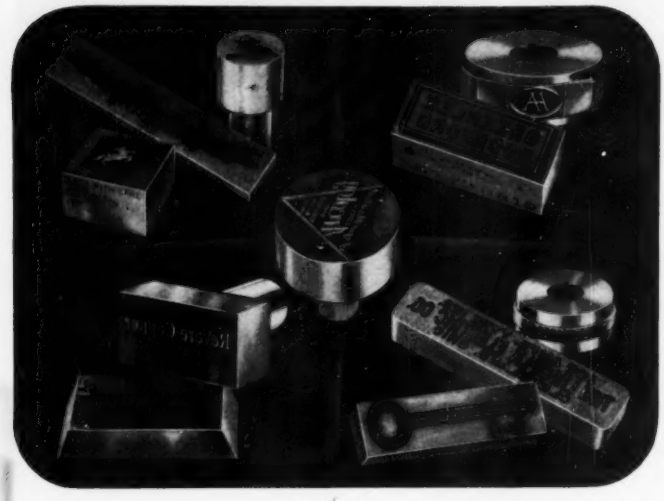
A MARK IS ONLY AS GOOD AS THE DIE THAT MADE IT



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Last Longer—Give Better Impressions

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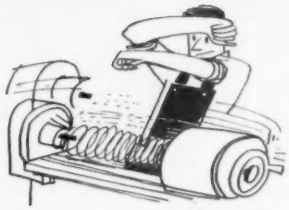
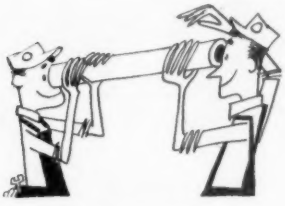


about the worst thing to which you can expose a carbide tool. Look at the flywheels they put on milling machines just to get rid of that high periodicity developed in the drive!

It is darn hard to expect machine-tool people, for instance, to launch into the development of super-high-speed machines relatively free of periodic vibration without more data to go on than is now available as to the outlook or promise of success.

Name Withheld



Boring Taper Holes

I have just read "Tooling Tricks at Watertwon Arsenal" (*AM*, April 30, p 89 and am especially interested in the tool for boring long taper holes.

I am a small-machine-shop owner, and from late '41 to the end of the war manufactured pierce-die liner inserts for 155-mm shells. Liners were 21 in. long, with a taper bore of ¼ in. in 21 in.

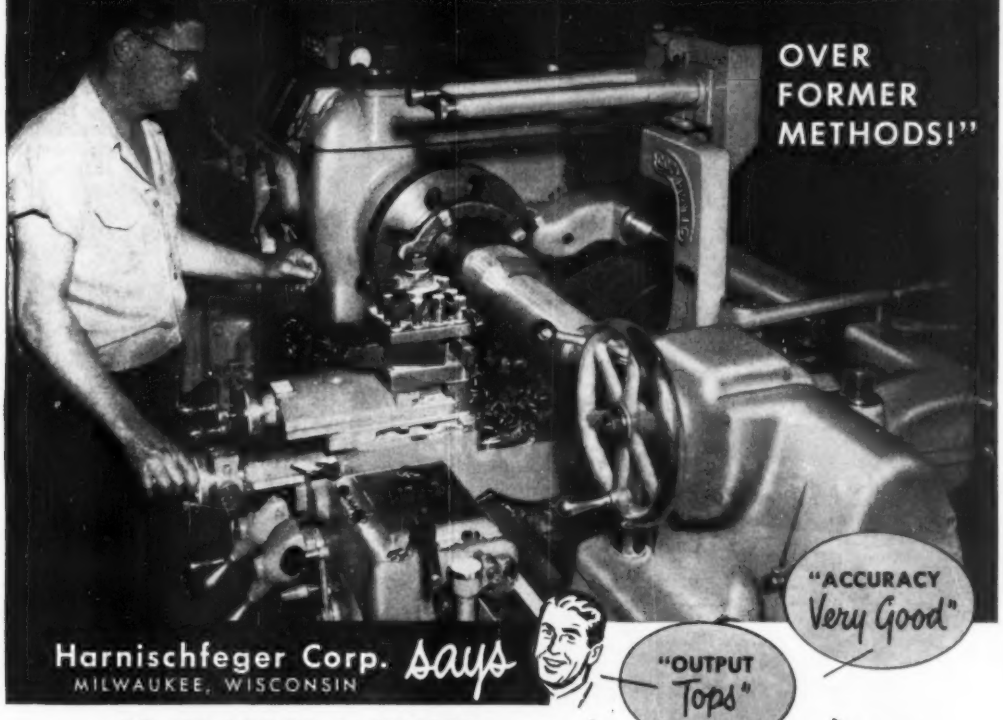
I developed a taper boring bar for this job, but it can be adjusted to a wide range of taper and length. This bar rotates, has a head which carries the tool, and is fed by means of screw and gearing on the end of the bar. The bar is attached to the faceplate and a pillow block.

Work is held stationary in two large steadyrests clamped to tailstock vees. The bar can be rotated in both directions and the tool feeds through from either end. As the bar rotates, the feed wheel is held stationary, causing the tool to feed.

I was able to finish-bore liners in two cuts from 6⅜-in. rough bore to 7¼-in. by 7-in. bore. The bar can made as long as the lathe bed will permit, and could be manufactured easily and at a low cost.

Fred Fisher, Manager
The Fisher Machine Co.
Corning, Ohio

"25 to 40% Time Saved... OVER FORMER METHODS!"



Harnischfeger Corp. says
MILWAUKEE, WISCONSIN

"ACCURACY Very Good"

"OUTPUT Tops"

"VERSATILITY Very Good"

"DESIGN FEATURES Excellent"

Like them very much"

OF ITS LODGE & SHIPLEY

COPYMATIC LATHE

In a series of case history advertisements, owners have told you how their Lodge & Shipley Copymatic Lathes are saving time and money, giving far better performance.

In every case Copymatic owners report notable time savings, ranging up to as much as 70%! Here, Harnischfeger Corp., a noted crane, hoist and heavy equipment manufacturer obtains a 25-40% savings.

In the illustration, a pinion shaft for an excavator is being turned before heat treating. At 160 surface fpm, the carbide tool is being fed at .018" per revolution, taking a heavy ⅝" hogging cut on an SAE 4140 steel shaft.

COPYMATICS are profitable producers for almost any size shop. Write for a set of Copymatic Case Histories and Bulletin No. 675.

THE Lodge & Shipley COMPANY
MACHINE TOOL DIVISION • 3059 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

From golf clubs

For finishing tricky combinations of wood and metal, a prominent golf club manufacturer has found that nothing equals heat-resistant Jewelox Cloth belts. Like all Jewel Brand Abrasive Belts they have the exclusive, smooth-running Velvet Joint.

to machine tools

Another grade of Jewel Brand Coated Abrasives is used for sanding the filling coat on heavy machine tools. The rough surface, plus a heavy coat of paint, makes this a tough job . . . but not too tough for Jewel Brand "open coat" New Process paper.

THERE'S A JEWEL BRAND COATED ABRASIVE to do every job, large or small, and to do that job *quicker, cleaner,* at *lower cost!* Ask your industrial distributor or write for catalog. Abrasive Products, Inc., 561 Pearl Street, South Braintree 85, Mass.

SHARPER, TOUGHER

Jewel COATED Abrasives

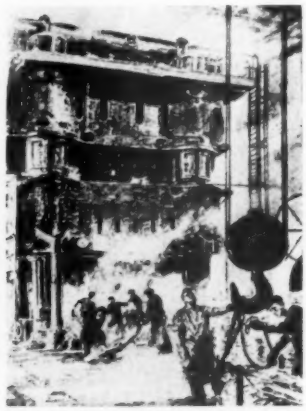
CUT COSTS!

England, Not Germany

The illustration used on top of page 149 (*AM*, Mar. 5—"How Big Should Presses Get?") shows a die-forging press with the following caption: "16,500-ton (U.S.) hydraulic press built and used in Germany during the war and being erected at the pilot plant in Adrian, Mich."

This caption is incorrect. The machine depicted is not a German 16,500-ton press but a 14,000-ton Loewy hydraulic die-forging press built by the Loewy Engineering Co., Ltd., in England and supplied to a plant in Great Britain.

W. KAUDERS
Hydropress, Inc.
New York, N.Y.



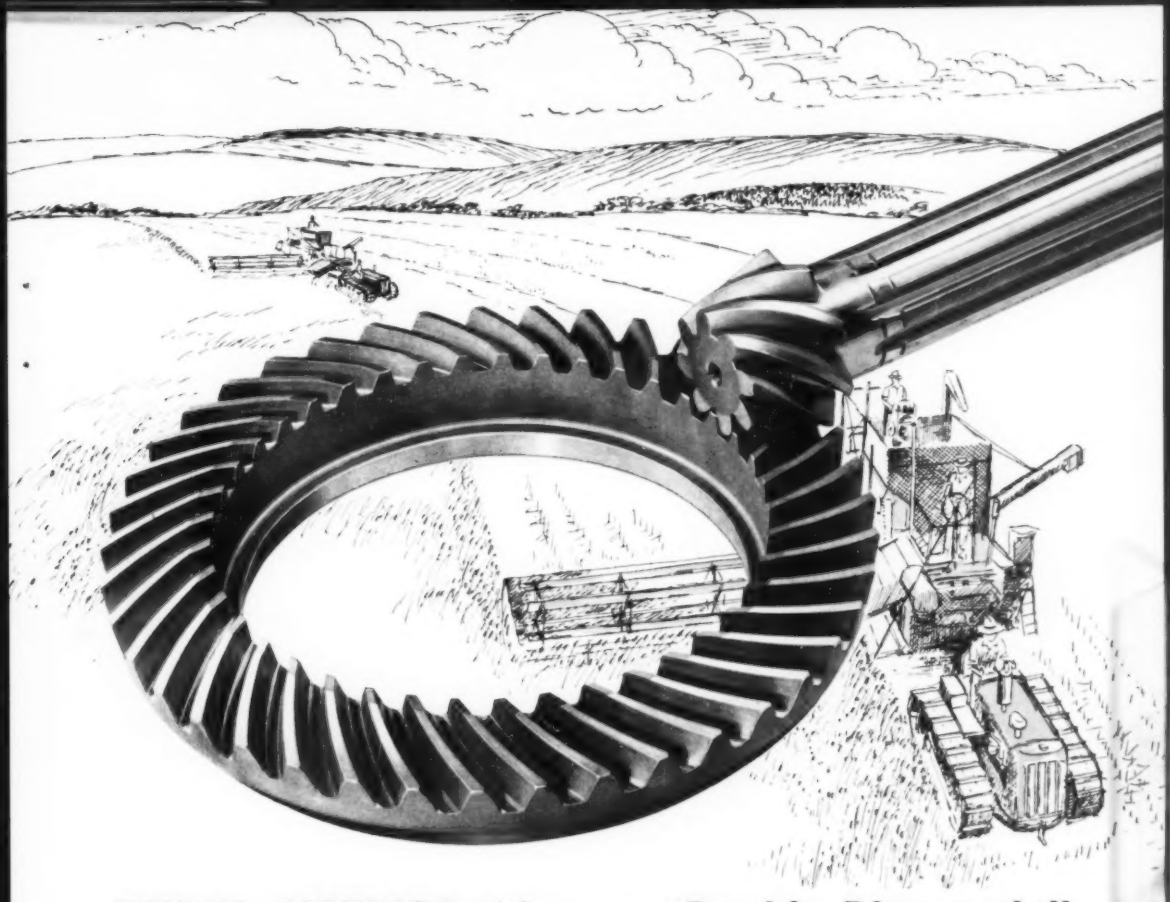
Mr. Kauders supplied AM with this artist's conception of the 16,500-metric-ton die forging press installed in Germany before it was dismantled and shipped to the United States. At the present time the press is being erected at the Air Force Manufacturing Methods Pilot Plant, Adrian.

Early Threads—Again

Max G. Gebauer was slapped down on page 113, *American Machinist*, March 5. I would like to slap him down again by saying that the "comb" tool or chaser was used for metal cutting by hand as early as 1888, and was at that time described in detail in "Modern Machine Shop Practice," page 268, by Joshua Rose, M.E., published by Charles Scribner & Sons, Vol I, 1888.

Mr. Gebauer said that the self-opening die head came into use between 1900 and 1910. On page 466 of the above book, it tells of a clutch-opening automatic die head.

Everett Odell
Instructor, Machine Shop,
Wallkill State Prison,
Wallkill, N. Y.



RURAL AMERICA rides on "Double Diamonds"

GEARS for farm machinery are not necessarily a specialty with us. Our production includes gears for many other applications. But it is a fact that thousands of farm machines move into their all-important jobs with power transmitted by "Double Diamonds."

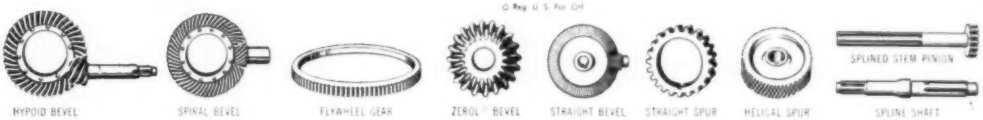
When you consider the beating that farm machinery takes, the industry's preference for "Double Diamond" Gears speaks highly of their stamina and all-round performance. It may suggest, as well, the advisability of calling in a "Double Diamond" engineer the next time you need gears of the many types we manufacture.

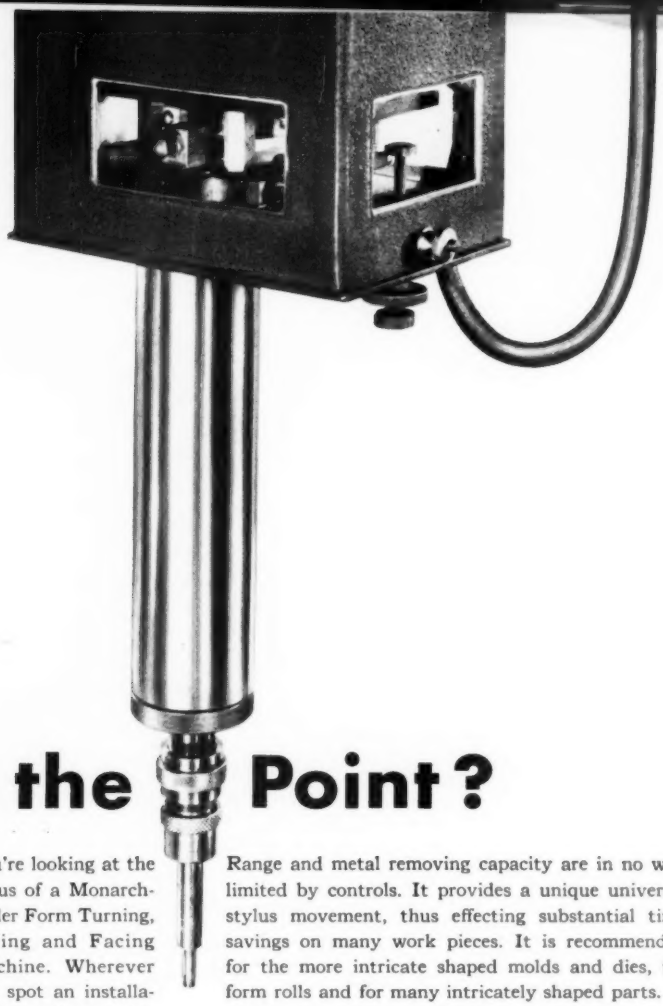
DOUBLE DIAMOND TRADE MARK GEARS

AUTOMOTIVE GEAR WORKS

RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS





Get the Point?

Monarch Series 60 Lathe with Monarch-Keller controls. These controls can be factory-applied to all Monarch Engine and Toolmakers Lathes, 14" size and up.

You're looking at the stylus of a Monarch-Keller Form Turning, Boring and Facing Machine. Wherever you spot an installation, you'll get the point immediately—here's a shop using modern duplicating methods to reach peak production at maximum profit. Here's a shop reproducing template contours to tolerances of .001" or less. And here's a shop with work coming through *fast* (we can substantiate actual time savings of 400 500%!). It's a good point, if it's in *your* shop. But it's tough, if it's competition.

Many advantages are offered by this first of all tracer controlled turning methods—in which Monarch has now accumulated 21 years of experience. Range and metal removing capacity are in no way limited by controls. It provides a unique universal stylus movement, thus effecting substantial time savings on many work pieces. It is recommended for the more intricate shaped molds and dies, for form rolls and for many intricately shaped parts.

Let us point out too, that only Monarch can deliver your choice of three tracer controlled duplicating systems according to your needs. They are fully described in the three booklets mentioned in the coupon. Just indicate your interest, and we'll send you the ones you wish. *The Monarch Machine Tool Company, Sidney, Ohio.*

Push button control cabinet (above), electric tracer and magnetic clutches constitute system. It can be instantly disconnected for regular lathe work under manual control.

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen: Please send without obligation the following complete Bulletins:

- ☐ Bulletin No. 2401—Monarch-Keller Controls
- ☐ Bulletin No. 2606—The Monarch Air-Gage Tracer
- ☐ Bulletin No. 2302—The Monarch Motor-Trace

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER...TURN TO MONARCH

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol E.P. Roller Grease

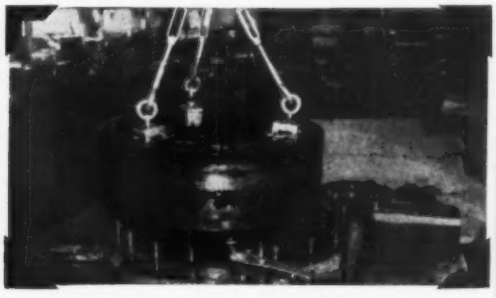
UNIT 16" × 44" roll neck bearing

CONDITIONS Temp. to 140°F — extreme pressures

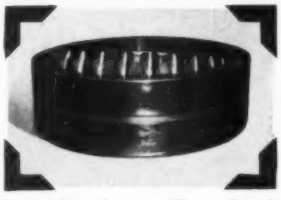
PERIOD 875 hours

FIRM Kaiser Aluminum & Chemical Corp., Spokane, Wash.

Grease retains "body" after 875 hours in rolling mill bearing



CALOL EP ROLLER GREASE-1X, in this big roll neck bearing and chuck, was sealed around the bearing during 875 hours of service in a "hot" rolling mill. No grease leaked from the chuck during operation in temperatures up to 140°F. The grease retains high lubricating qualities—is being changed only because it is practice to remove and service the bearings at intervals of approximately 1000 hours.



THE 2800-POUND BEARING shows no wear on either the rollers or race. There was no sign of corrosion in the chuck and neoprene seals were perfect. After cleaning the unit was re-assembled, refilled with 125 pounds of CALOL EP Roller Grease-1X, and put back in service.

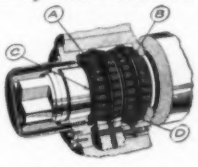
REMARKS: The Kaiser Rolling Mill at Spokane, Washington, produces sheet and coil aluminum. Roll neck bearings in the mill have been lubricated with CALOL EP Roller Grease since 1946. Made from highly specialized stocks, this grease will solve many of your anti-friction and plain bearing lubrication difficulties where extreme pressures, high temperatures or water conditions present problems too great for conventional greases.

To provide efficient operation in varied applications and sizes of anti-friction and plain bearings, CALOL EP Roller Grease is made in several grades. The heavier grades have an extra component to increase their adhesiveness.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

How CALOL EP Roller Grease protects heavy-duty anti-friction bearing



A. Contains extreme pressure additives—lubricating film will not squeeze off under heaviest loads.

B. Highly water-resistant—sticks on bearings even where excessive water used for cooling.

C. Feeds slowly and evenly—creeps into small clearances and assures good lubrication. Pumps easily at low temperatures.

D. Will not corrode metal or harm neoprene and plastic seals.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

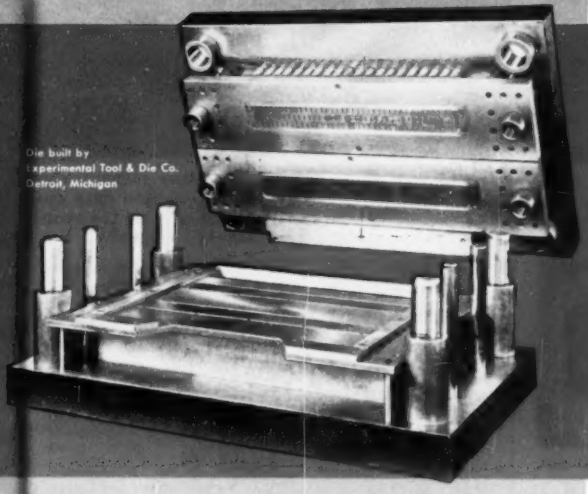
THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

PIECE PART REJECTIONS REDUCED

90%

Diemakers at Experimental Tool & Die Company solved a costly repair soldering problem on these stamped radiator heads with the die shown below. Precision was the secret. Die tolerances were held to within .0001" and all die components had to be interchangeable. That's why they specified . . .



Die built by Experimental Tool & Die Co. Detroit, Michigan

DANLY

DIEMAKERS' SUPPLIES and PRECISION DIE SETS

Die Sets | Dowel Pins | Die Springs | Cap Screws | Stripper Bolts

CALL ON THE DANLY BRANCH CLOSEST TO YOU FOR FAST LOCAL SERVICE

***CHICAGO** 50, 2100 South Laramie Avenue
***CLEVELAND** 14, 1550 East 33rd Street
***DAYTON** 7, 3196 Delphos Avenue
***DETROIT** 16, 1549 Temple Avenue
***GRAND RAPIDS**, 113 Michigan Street N.W.
INDIANAPOLIS 4, 5 West 10th Street
***LONG ISLAND CITY** 1, 47-28 37th Street
***LOS ANGELES** 54, Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2, 111 East Wisconsin Avenue
PHILADELPHIA 44, 18 West Chelten Avenue
***ROCHESTER** 4, 16 Commercial St.

**Indicates complete stock*

Diemakers everywhere depend on Danly precision. Every Danly product—die sets, dowel pins, die springs, cap screws, stripper bolts—is designed to complement the finest die work. For complete, reliable service, come to Danly!

DANLY

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

SPOT NEWS of Metalworking

- **First crack-down by OPS Cleveland office** ended with a scrap company paying triple damages for charging an over-ceiling price for aluminum borings from February 12 to March 27. Central Iron & Steel settled by paying $535.17 or three times the overcharge.

- **U.S. submarines, not yet ready for nuclear power,** will get soon a new light-weight diesel power plant. Details still are classified, but it's known to be a radial, 16-cylinder, two-cycle diesel. Engine is mounted vertically with four rows of cylinders branching out radially. Construction is of all-welded steel. Power plant weighs about half that of present equipment and has considerably greater power.

- **United Automobile Workers have promised General Motors,** with one exception, not to permit prior to June, 1955, any strike, slowdown, sitdown, stay-in, curtailment of work or other interference with production. Strike is permitted only over fairness of production standards, but only then after authorization by international union and after five-day notice to GM. Otherwise, disputes over contract application will be decided by impartial umpire.

Army Ordnance Corps has come up with a grease for automotive equipment which works just as well in Alaska as in Panama. Ordnance hopes the new grease will simplify problem of lubricant supply plus obviating need for changes in lubricants with changes in climate. Still unnamed, new lubricant probably will be available for civilian use in near future.

- **An experimental hydraulic 340-hp switching locomotive** has been developed by Electro-Motive Division of General Motors. It is powered by two GM 6-71 diesel engines equipped with Allison torque-converter transmissions. New unit, not yet scheduled for production, saves much copper and can be built in much shorter time than other locomotives of comparable capacity.

- **Wage Stabilization Board is miffed** because Eric Johnston injected himself into wage policy discussion. WSB members want a freer hand. Labor members may make trouble again. Conflict has arisen over base date of cost-of-living catch-up wage formula. Public and labor members want a flexible date, like date of last contract. Johnston insists on keeping present base of January 15, 1950.

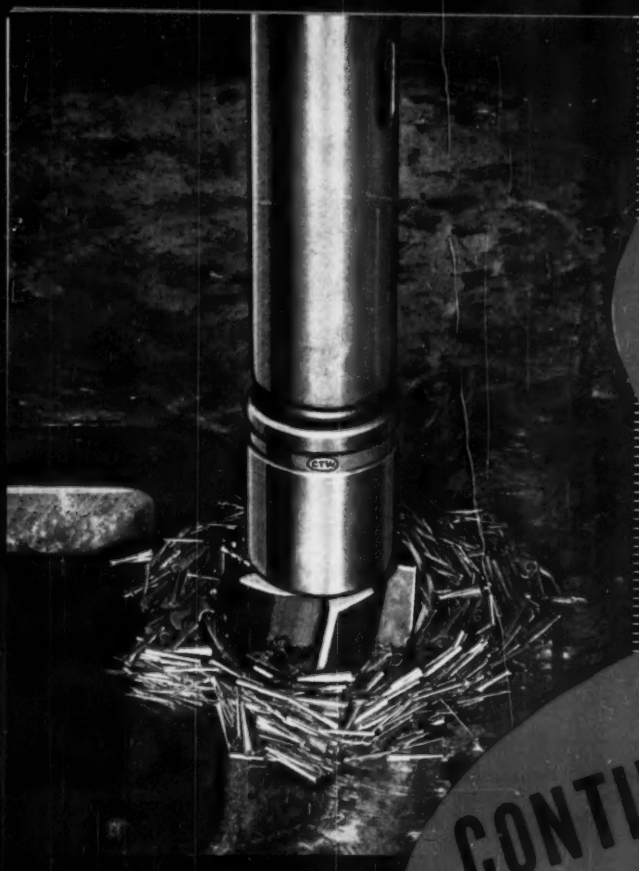
- **Italian machine tool builders are planning to make a strong bid** for an American market. Representatives are now seeking selling agents here. Italian machines have American threads, and dials are graduated in inches. Some machines already have been sold.

- **Employers trying to cut costs because of price pinch** may run into speed-up charges by unions. CIO unions struck two Akron, Ohio, plants on that basis. Issue will loom more important as result of Wage Board's approval of genuine increased productivity wage raises where employers forego higher prices. Some unions will insist upon higher wages without increased productivity. Trouble is that not enough manufacturers have followed General Motors in getting union concessions permitting cost-cutting practices.

Machine tool builders can figure in extra costs of subcontracting, overtime and shift premiums from base period to date they make contract for delivery of a new item under amendment to Machinery Order (CPR-30) which was issued last week by OPS. For details, see Machine Tools, page 89.

- **Defense Mobilizer Charles E. Wilson expects to visit** at least two Cincinnati machine tool building plants this week to arouse workers to need for getting out more machine tools and to tell them of the key role of machine tools in the defense program.

- **Italian machinery for $10 million Fiat truck plant in Mexico** will arrive soon in Mexico City. New plant will be financed jointly by a Mexican government agency and by Fiat. It will produce 1000 trucks a year, and later is expected to make tractors and diesel engines.



Above: Counterboring a hole in a cast iron machine base. Uniformity of chips indicates free-cutting action; chip disposal is aided by wide flutes. And when the operation is finished the cutter is removed from the holder with a simple *twist of the wrist.*

HAND DETACHABLE EVEN AFTER THE TOUGHEST CUTS

CONTINENTAL STANDARD DRIVE COUNTERBORES

There's no wedging action in Continental Standard Drive Counterbores. Cutters are removable from the holder with a simple *twist of the wrist,* even after the toughest cuts. Double driving lugs on the cutters engage double abutments in the holders to give a balanced, positive drive that practically is indestructible. Double bearing areas in the drive assure rigidity and proper alignment of cutters and holders. Continental Counterbores are available individually or in sets that include holders, cutters, countersinks and pilots in practical size ranges.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 32, MICHIGAN

Continental Counterbore Sets, available in your choice of three sizes, are fully described in Bulletin D27161. Send for your copy.

Washington

Congress has given the controllers a green light—for a short haul, anyhow. That's the real significance of the decision to okay a temporary extension of the Defense Production Act of 1950.

• • •

Congress doesn't really approve of all controls. It has serious misgivings about many, especially price and wage restrictions. But temporary extension will allow more time for controls to fail or succeed, for Congress to make up its mind.

And it clears the air on actual mechanics of controls. Most controls agencies already had drafted their operating policies. Now they can put them into effect without fear Congress will pull the rug out from under them by changing the law in a hurry.

• • •

Notice how wage-price policies now are taking shape. It is clear, finally, that both Office of Price Stabilization and Wage Stabilization Board have set up working rules on when to say yes to appeals for relief, when to say no.

For example, WSB wage control policy will be flexible with no hard ceilings.

• • •

For all workers, adjustments will be allowed to keep up with living cost rises. Thus, the 10% limit of the "catch-up" formula will be raised.

For those seeking "annual improvement," or productivity, increases, these will be allowed where the employer agrees not to demand a compensating price increase.

• • •

To combat labor pirating, increases will be allowed to correct "interplant inequities."

To maintain good relations within a plant, individual adjustments will be allowed to correct what are called "intraplant wage inequities."

• • •

To recruit labor for critical defense plants, higher wages will be allowed where the need is certified by government manpower and procurement officials. In addition, reasonable increases in pension, health, vacation and other "fringe" benefits will be permitted.

• • •

These policies make price control tough for everyone—for the government to administer, for industry to live with. OPS will concentrate on trying to keep prices where they are on cost-of-living items.

OPS will insist on absorption of higher costs, including labor costs. That means a squeeze on profits—and a threat to production if carried too far.

• • •

How much additional cost can industry absorb? You can see OPS' attitude on this in its 85% rule for deciding appeals for price relief. A machinery builder, for example, can't get a price boost if the machinery-producing industry as a whole is earning 85% of the average for its best three years from 1946 to 1949.

This will give business enough profits for expansion at about 1947-48 rates, as well as for dividends, OPS economists figure. But OPS will make exceptions for hardship cases — where industry profits are low or where one firm is in the red.

• • •

Expansion of CMP to cover all hard goods production now is in sight. That's behind National Production Authority's ruling that makers of consumer items, including autos and appliances, must file applications for their fourth-quarter needs for aluminum, copper and steel.

Allotments for all other hard goods will go out July 1. Steel mills won't be forced to accept them until September 1, but that's a technicality. Most allotments will actually be ceilings on metal use, compel scaling down of steel orders for delivery in July and August.

• • •

Unallocated metal will be set aside for consumer goods in the third quarter. Mills will be directed to hold about 10% of steel. There'll be less aluminum and copper for consumer goods.

You can't get any more metal than your allotment allows in the quarter. Certificates will be issued to consumer goods makers. You won't be able to order any "free" (unallocated) copper, steel, aluminum without one. The mills won't take the order.

• • •

You'll hear more about a new Small Defense Plants Corp. Congress almost forced creation of one while considering controls legislation. It will take up the idea again later this year.

New agency would represent small business in all mobilization fields, according to present plans. It would claim allocations of raw materials; get prime contracts from the military, subcontract them to small firms; get financial aid from the government.

• • •

More men—draftees and reserves—will be called up this fall. Draft calls will swell to about 45,000 men a month to replace troops on duty now in Korea.

More reservists, especially officers, will be needed to replace many now in service. A new law fixes service of involuntary reservists at 17 months. That means many now in uniform will be released starting in October, will have to be replaced.

Average diameter of a hole
Bearing race matching
Angle between bore and face
Diameter
Thickness
Bore center distance
Crank throw, eliminating all error due to diametral tolerance
Twist
Bend
Typical Dimensions and Relationships measured with Sheffield
PRECISIONAIRE GAGES
The range of dimensions and position relationships which can be measured quickly and precisely by Precisionaire Gages is almost limitless. In fact, some such measurements are possible otherwise only by elaborate auxiliary equipment in a well equipped laboratory to obtain the same degree of accuracy. Illustrated here are typical Precisionaire applications in which deviations have been exaggerated for greater clarity.
Precisionaires are the only gages which offer the combined advantages of greater linear scale length, amplifications of less than 1,000 up to more than 100,000 to 1, and instantaneous accurate reading regardless of the distance between the gaging element and the base instrument.
"If it can be gaged by air, it can be gaged best by Precisionaire."
Write for Precisionaire Application Book—
or call your Sheffield Representative.
the Sheffield corporation
Dayton 1, Ohio, U.S.A.
SHEFFIELD
Lobing or cloverleaf of a centerless ground shaft
Internal radial clearance
Flatness
Distance between hole centers eliminating all error caused by diametral tolerance
Center distance of incomplete holes eliminating all error caused by diametral tolerance

Detroit

Talk to the technicians and you get a picture of the mechanics of the automobile in 1952—or 1956—or 1960. The long look is the most typical look at the Society of Automotive Engineers, whose summer meeting concluded this month at French Lick, Ind.

Here's what's in the cards:

1. **Newer shapes and sizes in combustion chambers,** leaning toward Chrysler's hemisphere design and the Olds squatty, squarish pattern. Why? More even firing, slower deposit accumulation. (Cylinder head deposits reduce power 10% or so in 5,000 miles, require gasoline 8 to 12 octane numbers better after 10,000 miles).
2. **More high compression engines.** Prospectively you'll see newer powerplants of this type on the 1952 offerings of DeSoto, Ford and Dodge—maybe on Lincoln and Mercury, too. DeSoto might appear with a V-6 in the high compression range; Ford may have a V-6 as well as a V-8. A little farther down the road Plymouth has one also.
3. **Lighter weight automobiles.** The new engines themselves are light and smaller. The smaller size permits smaller over-all length. That in turn reduces weight. When over-all weight is reduced (if you want to go on around the circle) you can make the powerplant a bit smaller, too. And so on.
4. **Better transmissions.** General Motors developed one some time back, it will turn up in 1952. Essentially it's a refinement of the Hydro-Matic, aimed at getting better middle range acceleration and at offering more flexibility for town and country driving. Chrysler has one which advances its torque converter job (shown on the 1951 Chrysler) a step forward.

• • •

Things you won't see for at least a good term ahead: Rear-engined automobiles. There are several of them on test, and have been. The unusual problem the technicians ran into is the need for dual rear wheels. The combined weight of engine, transmission and differential is too much for single wheels. The tire people might be spurred into action on this one—but it's far, far off.

Listen to an automobile executive in the throes of ordering equipment for a mammoth military job. "We ordered this special machine tool and got an April 1952 promise. Then we passed along a DO and back came the promise—July 1952. We went around and asked 'how come?' Washington said that if we hadn't had the DO we wouldn't have gotten delivery till October. I don't know what to believe any more."

Machine tool delivery promises, as seen by the auto companies, keep growing longer. Purchasing agents are being told that backlogs are lengthening slowly and steadily, with both civilian and military requirements coming into the picture currently.

• • •

Detroit machinery makers are handicapped by lack of skilled manpower. One middle-size shop, not untypical, is working 10 hours a day, six days a week, with a skeleton second shift. It would like to go onto an 8-hour, 2-shift basis, but can't find any part of the 100 men required.

Employers are trying just about everything to find people. Witness a television "help wanted" program over a Detroit station. You can buy time, use it to describe your company and its history, show shots of the jobs you want filled, detail them.

Or you can shower your neighborhood with letters addressed to each householder, telling of job opportunities. That's been done, too.

While skilled factory tradesmen are hard to find, there is a momentary sag in general employment. The Detroit index is drifting downward from its April peak. Beset by allocations (and by non-peak demand at the retail level) auto companies are reducing schedules, laying off people. There isn't much of that yet, but it's beginning, and it will grow as the summer wanes.

• • •

Automobile production will go down about 20% during the third quarter. The readjusted quotas out of Washington provide for 1,200,000 U. S. cars in the next three months; output in the second quarter totaled about 1,500,000 reached on a modestly declining plane that tapered to an anticipated 485,000 in June.

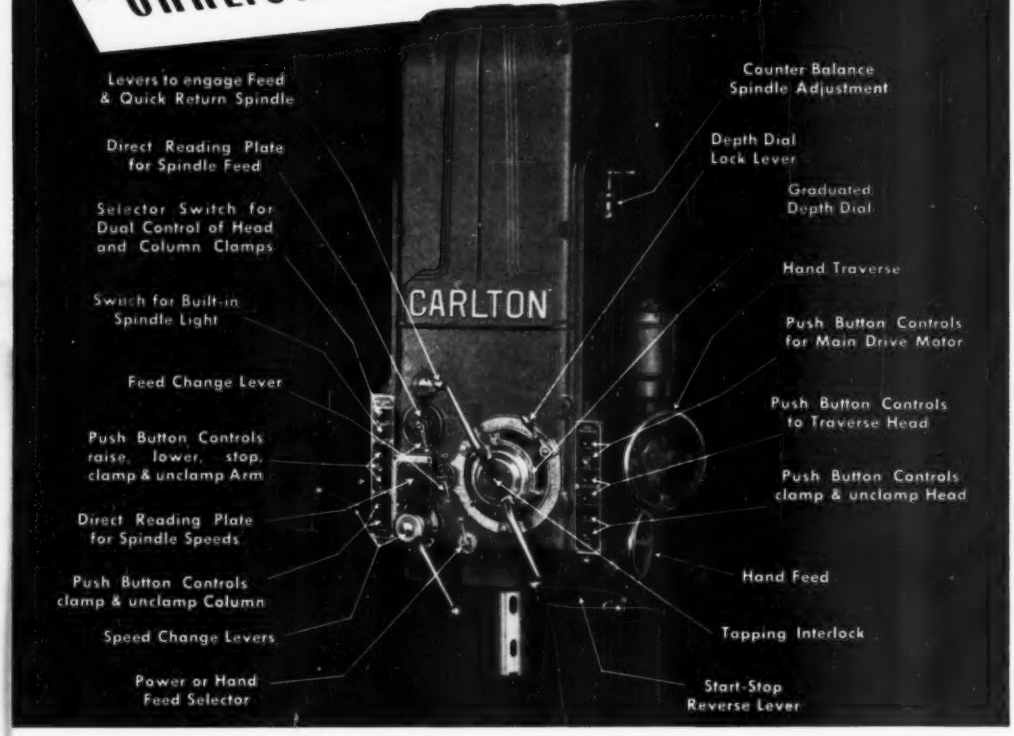
As during the quota system for materials preceding World War II, large companies are unhappy. They took larger percentage reductions than the smaller competitors.

Conceivably, though not likely, they can make some of this up. Allocations are actually based on steel, copper, and aluminum used. The formula works like this: Each company has a specified percentage of the industry's 1,200,000 total. That percentage must be applied to steel, copper, and aluminum. Those metals can be bought in the tonnage thereby indicated. If the companies can stretch it, well and good.

Will new models result? Or lighter models? Not to any degree of note. Moves of that sort in mid-year would be decidedly abnormal if they were substantial.

The one possibility for savings lies in substitution of cast-iron pistons for aluminum pistons. However, unless aluminum is cut further than at present—and this may be coming later—such changeovers are not likely now to follow.

★ CARLTON Centralized Controls


Levers to engage Feed & Quick Return Spindle
Direct Reading Plate for Spindle Feed
Selector Switch for Dual Control of Head and Column Clamps
Switch for Built-in Spindle Light
Feed Change Lever
Push Button Controls raise, lower, stop, clamp & unclamp Arm
Direct Reading Plate for Spindle Speeds
Push Button Controls clamp & unclamp Column
Speed Change Levers
Power or Hand Feed Selector
Counter Balance Spindle Adjustment
Depth Dial Lock Lever
Graduated Depth Dial
Hand Traverse
Push Button Controls for Main Drive Motor
Push Button Controls to Traverse Head
Push Button Controls clamp & unclamp Head
Hand Feed
Tapping Interlock
Start-Stop Reverse Lever
CARLTON

For complete information, send for descriptive bulletin.

★ GET MORE FOR YOUR MONEY . . . get Carlton Radial Drills:

MECHANICAL ADVANTAGES

Ground teeth, hardened gears with wide faces.

Hardened spindle.

Ball and roller bearings.

Column clamp mounted in Arm.

All parts, wherever possible, are machined from drop and hammered forgings.

MAINTENANCE ADVANTAGES

Every part is jig machined to guarantee absolute interchangeability of parts.

Entire machine is assembled on the unit principle.

Only one friction clutch unit to adjust.

Simple electric circuits to all motors.

Easier to keep clean.

OPERATION ADVANTAGES

Dual clamping to Head and Column. Automatic clamping for Arm to Column.

Pushbutton operated Arm elevating control.

Automatic lubrication to column with column cleaned by wipers from top to bottom.

2 levers control 36 spindle speeds from Head.

Direct reading and indicating speed and feed chart.

Electric light built in Head near spindle.

Adjustable counterbalancing spring operating with standard geared-to-spindle counterweight.

Positive feed clutch with serrated teeth.

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THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.

Machine Tools

Extra costs for subcontracting, for overtime and for premium pay for second and third shifts are allowed in an amendment to CPR-30 issued last week by the Office of Price Stabilization.

These factors now can be figured in prices by machine tool builders. The refusal of OPS heretofore to give legal status to these costs has retarded machine tool production.

The fact is that subcontracting had been curtailed by some builders in the absence of any assurance from Washington that the extra expense could be charged in the price of the product. Other builders refused to take on subcontracting until such costs were approved.

• • •

No standardized allowable increase is being set for subcontracting. Each builder will be covered on the basis of his own additional cost. He will be permitted to figure in such extras as supervision of subcontracting by traveling or resident inspectors.

A simplified means is provided for arriving at the extra costs. It won't be necessary to go into all the details for all types and sizes of machines. OPS thus aims to cut down the bookkeeping.

• • •

Base period for determining machine tool prices will continue to be pre-Korea. However, the Industry Advisory Committee to OPS is pushing hard for shifting the base to prices which prevailed in the freeze period last December 19 to January 25.

Talks looking toward this objective have been going on in Washington. Final favorable action hinges on the question of how depressed the industry's prices were in the pre-Korea base period.

• • •

Final draft of the amendment to CPR-30 came out of meetings of OPS with the Task Force of the Machine Tool Industry Advisory Committee. H. K. (Tony) Clark, deputy chairman of the Munitions Board, had a big hand in expediting the amendment's adoption.

• • •

A deficiency bill passed by Congress has made available around $40 million for further pool orders for machine tools. The total may be enlarged by $20 million to a total of $60 million. Reasons: (1) three builders have rejected pool orders, and dollars allotted them have come back for redistribution; (2) government people failed to remember when they first gave out pool orders that if GSA had to recover and pay for some of the machines, the outlay would be 82.5% of the market price, not 100%.

This pool-order money is likely to be allotted by June 30, end of the 1951 fiscal year. More funds for pool orders are in the Congressional making in connection with fiscal 1952 appropriations.

• • •

NPA intends to stick to its policy of giving pool orders for so-called critical tools essential to the defense production program.

NPA does not plan to spread pool contracts to blanket the machine tool industry. NPA's attitude: if a builder does not make a machine vital to defense production, and he needs work, he should seek a subcontract from a builder whose machines are in the critical class.

Some mechanical press builders, who probably won't be too busy on defense work, will be urged by NPA to become subcontractors to machine tool builders.

Two big manufacturers — Fisher Body and Miehle Press — are likely to build complete machine tools as subcontractors. Their participation depends upon NPA's placing large pool orders. Both companies built large numbers of machine tools during World War II.

• • •

Fourteen machine tool builders have neither accepted nor rejected pool orders placed with them weeks ago. They have been waiting for clarification of prices. They probably will be asked soon to say "yes" or "no."

• • •

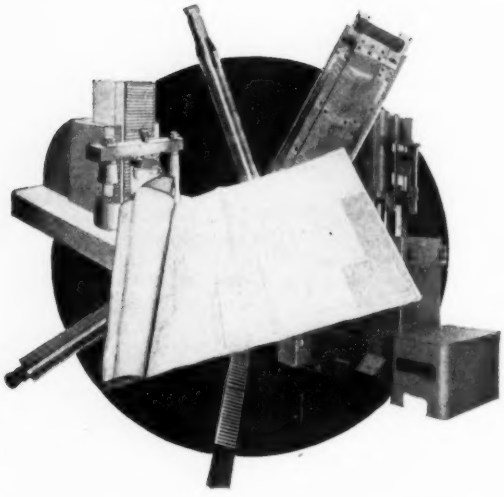
Official Washington is in a flurry of excitement over the machine tool industry. Messrs. Benedictus and Van Valkenberg of DPA are making reports on machine tools to Charles E. Wilson's office. Van Valkenberg is surveying the world demand for U. S. machine tools. He has come up with figure of $300 million. That includes the British as well as other countries.

George Pollard of the Bureau of the Budget has been visiting builders to study their situation. So has Clay Bedford, Wilson's special assistant, who used to be general manager of Kaiser-Frazer. General Ford, chief of Army Ordnance Corps, sought a briefing recently from industry representatives on the machine tool outlook.

Washington would like to see machine tool production hit a minimum of $800 million both in 1952 and in 1953. It would feel even better if the figure was $900 million.

• • •

Marshall M. Smith, chief of the General Industrial Equipment Division of NPA, will return to his post as vice president of E. W. Bliss Co. before the end of June. He already has stayed longer in NPA than he had agreed to. NPA has been looking within the machine tool industry for a successor.



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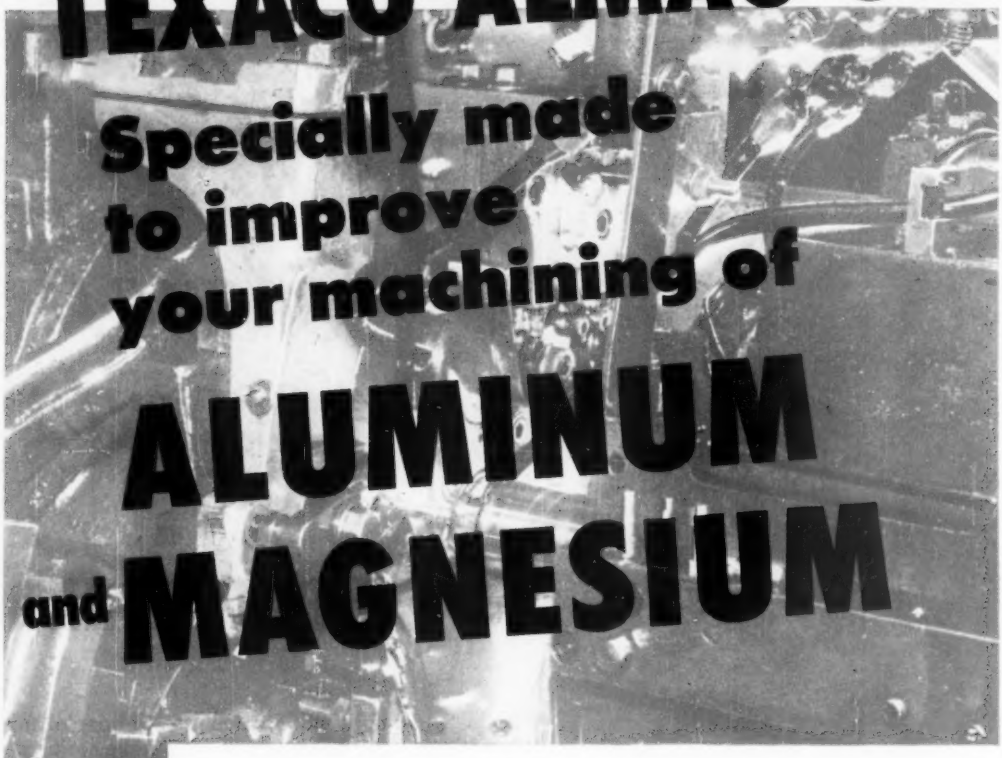

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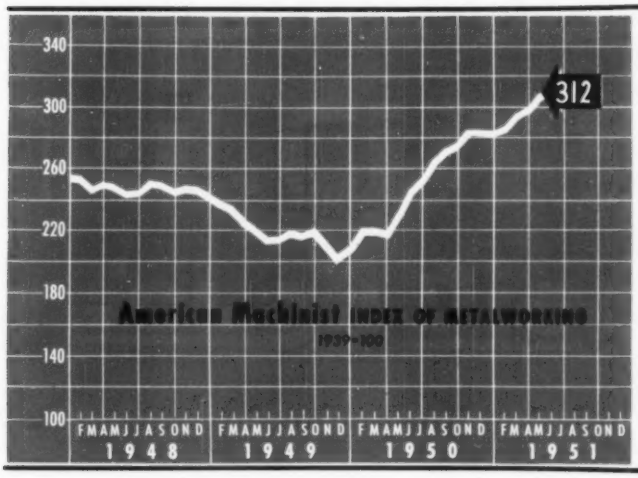
Gaging Metalworking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American Machinist INDEX OF METALWORKING
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1948
1949
1950
1951

INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JUNE '51	MAY '51(p)	APR. '51(r)	JUNE '50
	312*	309	307	258
Machinery	304	299	234	
Electrical Manufacturing	357	353	289	
Automobiles, Trucks	240	250	260	
Transportation Equipment	374	362	225	
Other Metalworking	323	320	273	

* Estimated (p) Preliminary (r) Revised

Vacation Shutdowns Will Slow Metalworking

The third quarter will be a time of turmoil for the metalworking industries. Operations are bound to get bogged down a bit by wholesale shutdowns for vacations. Of 445 Cleveland plants surveyed, 216 employing 94,000 workers will close for two weeks, except for mail, emergency service and maintenance work. Remaining 229 factories will stagger vacations because of press of defense production.

Situation in Cleveland will be duplicated throughout the nation. In hundreds of cases, union contracts specify paid vacations.

• • •

Metalworking this summer will be in the tooling period so far as defense goes. The real step-up in armament production will come later.

Yet there are no signs of unemployment except in isolated cases, despite a letdown in manufacture of civilian goods. Manpower is even more of a problem than materials.

Managements say that they are scraping the bottom of the barrel for skilled workers and for technicians. If a temporary lull comes between civilian and munitions production, many companies are giving men "made-work" rather than laying them off.

• • •

American Machinist's index of metalworking production is estimated at 312 in June, up three points from May, and 54 points above June of last year.

The downtrend in the automobiles component continued, but all other metalworking components gained. Transportation equipment, other than cars and trucks, climbed 13 points.

• • •

Cutbacks from the automotive industry have had little effect in many parts manufacturing centers. Big defense contractors in metropolitan areas are recruiting forces at the expense of less fortunate metalworking firms.

Many component parts makers find that the shift from civilian to military customers makes little difference in their business. Instead of fabricating a part for a passenger car, they do the same kind of work for heavy-duty trucks, tanks, self-propelled guns, the aviation industry.

But some companies tied closely to Detroit will have slack times until fall when they can gear operations to defense work.

• • •

Orders have continued to pour into contract tool and die shops, according to National Tool & Die Manufacturers Association. Backlog averages three months—very high for an industry where quick delivery is the rule.

Both orders and shipments are running far ahead of the comparable 1950 period. Shops are operating about 50 hr a week, with direct labor at 32 men per shop.

About half the work being done by tool and die shops has a DO rating.

Gaging Business

After 16 consecutive months in which new orders exceeded shipments, screw machine products makers report business falling off. Decline has been sharp since June 1. Currently the industry has 20-30% defense business, but some plants are as high as 60%. Pile-up of orders extends into the fall months.

• • •

Stamping plants which have got automotive cutbacks are doing very well on business from miscellaneous sources. Materials are easier than they were 5-6 months ago. Companies just now securing part of their steel at premium price — mostly foreign steel — are protesting government decision that they may not include cost of premium in their prices. If stamper had been paying the premium before price regulations became effective, he could figure in the extra cost in his price!

• • •

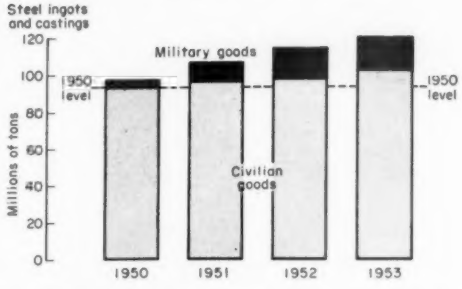
Gray iron foundries say that scrap situation is easing (they use one-fourth of all scrap). More scrap has appeared especially in the Buffalo and Wisconsin areas. Casters are frantically seeking substitutes for scarce alloying metals. Some have turned to vanadium instead of molybdenum, but former is rapidly disappearing. The industry was given about half the nickel it asked for this month.

Mid-July is probable date when gray iron foundries will have to roll back prices. The June 1 deadline proved unrealistic and unworkable.

• • •

Housing starts of 97,000 in May were higher than expected. Total for first five months was 444,500, well over half of year's objective of 850,000 units.

How Much Steel for Industry?



Year's housing starts are now estimated at close to 1 million units.

• • •

Makers of malleable iron castings say that decline in orders from passenger car field has been more than offset by increases from builders of trucks and other heavy vehicles.

Industry's backlog has lengthened to 8-10 months. Shortage of raw materials has caused some plants to close for a few days at a time and others to shorten the work-week.

• • •

The military will take 18% of nation's copper in third quarter, as against 12% in April. For all of fiscal 1952 (beginning July 1) it will require 22%. These rising percentages are on a fairly fixed supply; no important new production is in the making.

Some 30% of aluminum supply will go to military production in third quarter, and 32% for the '52 fiscal year.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	229.7	229.5	213.4
Steel ingot operation (thousands of tons)	2,063	2,063	1,927
Electric power output (million kilowatt hours)	6,734	6,445	5,921
Production of automobiles and trucks	155,174	121,476	200,515
Engineering construction awards (*Engineering News-Rec.*, millions)	206.9	296.0	277.4

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators, domestic sales (thousands of units)	446	591	546
Vacuum cleaners sales (thousands of units)	227	290	293
Washers sales (thousands of units)	285	368	333
Household electric ranges sales (thousands of units)	123	162	131
Television receivers production (thousands of units)	1,358	1,738	1,244
Radio receivers AM and AM-FM production (thousands of units)	481	869	543
Gear sales index (1935-1939 = 100)	742.5	830.7	328.6
Foundry equipment new orders index (shipments 1937-1939 = 100)		599.0	160.6

* Seasonally adjusted.

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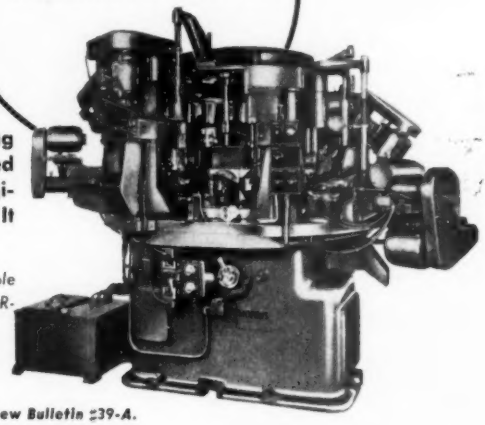
This Morris Center Column Machine taps, drills and spot faces carburetor bodies with production of 320 pieces per hour at 80% efficiency. In the same plant, two other Morris Machines save time, money and space, producing other carburetor parts.



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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Tax Relief—Not a Tax Grab

The anti-industry boys are at it again. They are yelling at the top of their lungs about the "tax grab" perpetrated by manufacturers in connection with accelerated amortization of new facilities for defense production.

The facts, however, belie such a charge. They show that a heavy tax burden has been lifted from taxpayers' shoulders. Industry is financing plant expansion which the government otherwise would be compelled to do.

IN WORLD WAR II, billions of dollars were doled out of public funds to pay for new war plants and new equipment. The American people became owners of hundreds of new factories almost overnight.

When Korea burst upon us, the nation again had to enlarge speedily its raw materials and manufactured goods capacity. But this time Uncle Sam did not have to dig deeply into his pocket. A new plan was adopted instead.

Congress decided to hold out bait to industry to spend its own money rather than the public's. It put through a rapid depreciation allowance as part of the Revenue Act of 1950.

The program had three objectives: (1) to expand productive facilities enough to meet all defense needs; (2) to get industry to do it with a minimum of government interference; and (3) to get the new capacity quickly.

TO ACCOMPLISH these objectives the Act allowed certified companies to depreciate a specified percentage of the cost of new facilities over five years instead of twenty.

The allowable percentage was arrived at by considering these factors: the capacity of the particular industry required for defense purposes; the degree of incentive necessary to induce expansion; and the estimated usefulness of the facility after the emergency period.

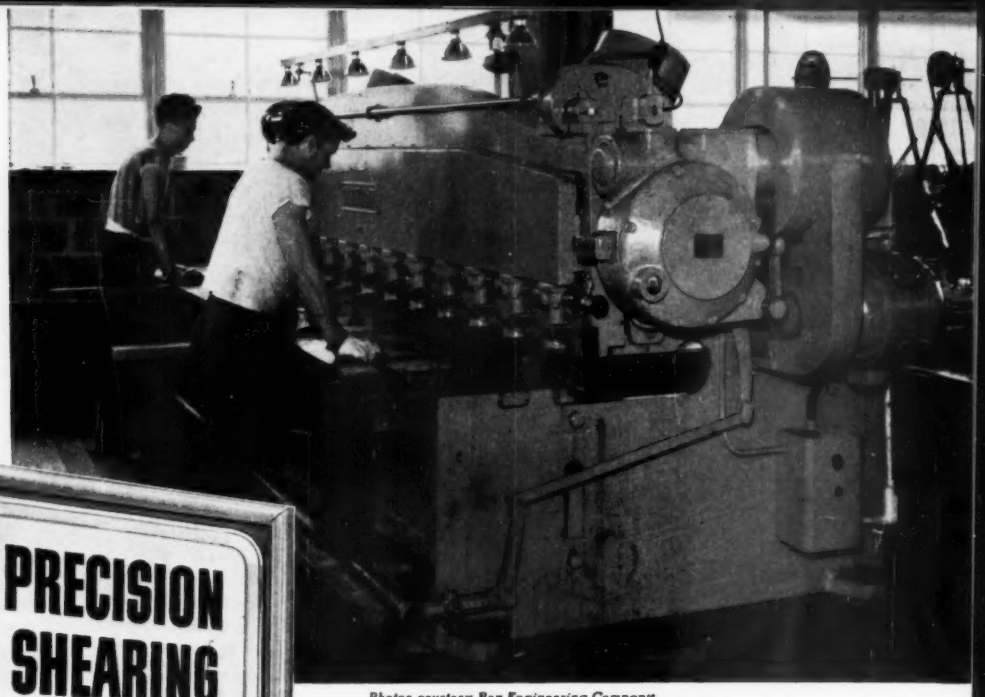
The certificates-of-necessity program has been a whopping success. Up to May 25, some 1425 certificates call for a cash outlay of $5,775,432,195.

Industry thus is spending its own money to the tune of almost six billion dollars to enlarge its manufacturing facilities and to bring to fruition the government's butter plus guns policy.

THIS IS NOT a tax grab. It is tax relief for every citizen. It is an insurance policy against the wrecking of our economy by substitution of complete government control and ownership for private initiative.

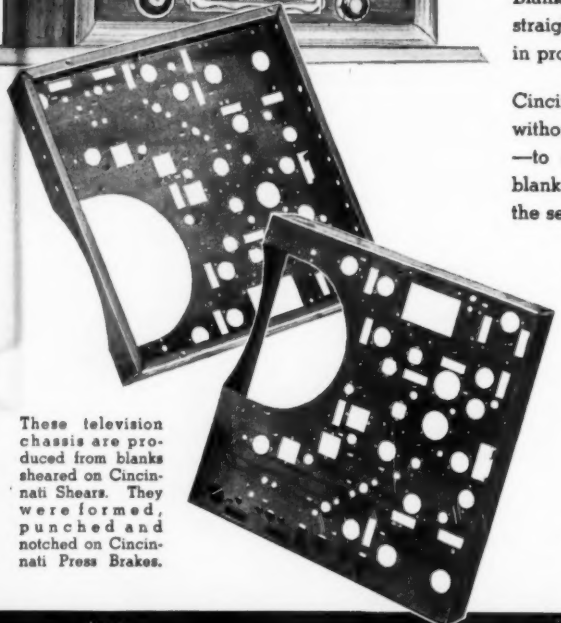
We have been preaching for years the philosophy that accelerated depreciation of production equipment will keep American industry strong, up-to-date and able to produce at a minimum of cost. The certificates-of-necessity program puts that philosophy into practice. It is beneficial to industry and to the nation.

Burnham Finney



Photos courtesy Rex Engineering Company.

PRECISION SHEARING



These television chassis are produced from blanks sheared on Cincinnati Shears. They were formed, punched and notched on Cincinnati Press Brakes.

Blanks for a television chassis must be accurate in size, straight sided and square, for simple, rapid gauging in progressive operations.

Cincinnati Shears produce these and other blanks—without costly blanking dies—with speed and economy—to a plus or minus .005" tolerance. Various size blanks are sheared easily and quickly by changing the setting of the gauges.

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High-speed drum sander removes heavy burrs from large holes. Inclined tables provide maximum visibility and comfortable working positions

BY H. E. LINSLEY
ASSOCIATE EDITOR

high production requires ingenious methods of

DEBURRING AIRCRAFT SHEETS

Hand filing takes too long and may be hazardous. Tumbling is impractical for large sheet-metal parts. But here are some of the tricks used by The Glenn L. Martin Co. to solve the problem

Steel wool and beeswax on a high-speed spindle produce a fine, smooth finish. Spindle height can be varied to suit operator convenience

Belt sanders are particularly well suited to deburring the edges of contoured sheet-metal parts. The operation is rapid and easy

Oversize drills offer a simple solution for deburring small holes. Work is held by hand, and a light touch is all that is required

DEBURRING AIRCRAFT SHEETS... continued

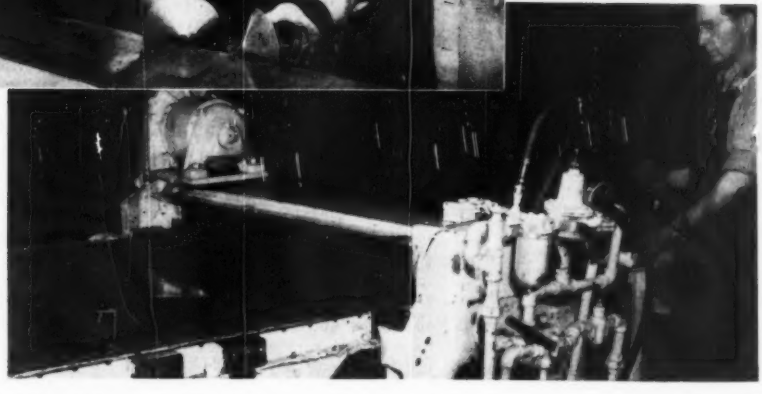
Portable pneumatic drill with countersinking tool is convenient for deburring the inside edges of holes drilled through tubular members

Tube ends are cleaned up on the ID with the conical cutter at left, OD by the corresponding tool at right. Each cutter uses a single blade

Triangular scrapers, made from old files, are best for small areas of relatively large units, as on this steel Z section

Cotton buffing wheel and polishing compound does a fast job when burrs are light. Stand for portable electric drill is shop made

Dime-store knife sharpeners —two tangent steel disks— equipped with hand guards, make a quick job on long, flat, sheet-metal parts



Burr removal is not always necessary. This machine at North American Aviation rolls burrs down to avoid scratching adjacent sheets

INDUCTION SOLDERS TO SIZE

Nonferrous metals can be induction soldered to close dimensions on automatic equipment if heat cycle, solder flow point and production rate are properly balanced

BY CHARLES H. YETMAN
HEATRONIC ENGINEERING,
UTICA, N. Y.

SOLDERING to close dimensions with automatic equipment and induction heat presents some new problems in technique and fixture design. This is particularly the case when the design of the work will not permit the parts to be fitted together, and where it is not possible to incorporate a recess or locating point for solder prefabs.

Nonferrous metals possess relatively low melting points, high conductivity and a low heat diffusion, as compared with steel. These characteristics cause critical situations when temperatures of 1300 to 1600 F are employed in silver solder applications. Production results show, however, that brass 0.022 in. thick, and copper 0.022 to 0.125 in. thick can be soldered economically by induction heat through the entire solder range of 400 to 1600 F.

Metal Thickness Important

Frequencies to be used are governed largely by the thickness of the material, the solder flow point and the rate of production. With 0.022-in. brass at any solder range up to 1600 F, rapid production is possible on a conveyor with 9600 cycles. With 0.125-in. copper or gilding metal (95 Cu, 5 Zn), a long heating cycle is necessary and multiple work coils are indicated. 450 kilocycles will produce a satisfactory heat pattern when used on a Geneva-actuated rotating table.

Solder prefabs are essential with induction heat, and can be obtained in almost any shape for the most exacting job. They will save up to 50% of solder costs, and produce uniformity in the joints, as well as making it easy for the operator to position the work in the fixtures.

Tolerances for dimensional soldering are usually ±0.005 in. for spacing, and ±0.002 in. for concentricity. These are specified on the triangular nameplate shown in the first illustration, and this is not too difficult as soldering is done at 400 F. The 0.002-in. thickness of the brass plate, however, precludes any embossing on the back to provide location points for attaching the two studs, so spacing must be taken care of by the design of the fixture and the heat pattern used.

In this example, two steel Carr fasteners are to be attached to the plate, and spring tension in the prongs must be maintained. This is achieved by burying the prongs in holes in the transite fixture, and by the fact that, being perpendicular to the lines of current flux, they will be little affected by it. Solder prefabs are ¼-in. sq and 0.010 in. thick, and have a flow point of 400 F. These are placed on top of the fasteners, and the plate is positioned in the fixture. The fixture is made from transite and is mounted on the rotary table of the machine on a 1-in. ceramic stand to give the necessary height to permit use of a 5-turn, round work coil. It also permits clearance between the coil and the table.

Holding Pressure Needed

To obtain a good bond between the flat fasteners and the irregular bottom face of the plate, it was necessary to employ pressure. This was done by transite rods supported in L-shaped arms and positioned over the center of the work. The lower ends of the rods rest on the work when the coil is in the heating position, and provision is made for placing any desired weight on the upper ends. In this instance, 6 oz are used during the heating cycle, but the weight of the rod alone is adequate in the cooling cycle.

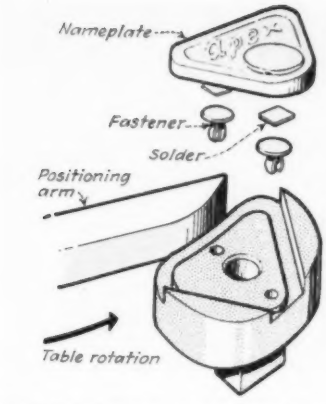
At the end of the heating cycle the work coil and pressure rods lift automatically to clear the work. The work-holding fixture is so designed that the work overhangs slightly to permit a horizontal pressure lever to bear against it. This pressure applied to the edge of the plate, pushes it into the V of the fixture and insures perfect alignment at the start of cooling.

Contraction of the heated plate and hardening of the solder occur simultaneously in this 400 F application, and simplify the problem of spacing the fasteners within allowable limits. The determining factor, of course, is the ability of induction heat to maintain a heat pattern without any fluctuation. If silver solder at 1200 F were to be used, a different heat pattern and fixture design would be needed.

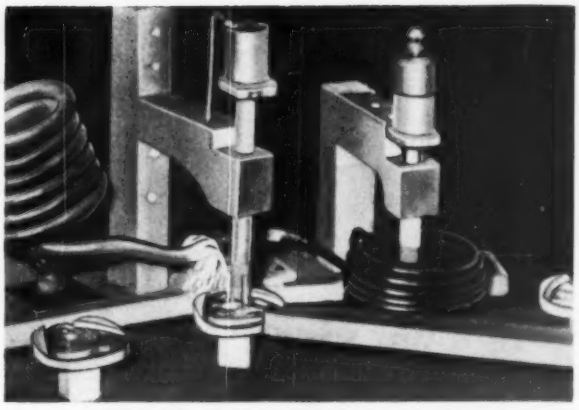
Conveyorize Hot Work

Production rate is 300 pc per hr, with one operator. Heating cycle is 8 sec, and 4 sec are allowed for table movement. Finished work is removed with the left hand while the right hand, using tweezers, positions the components of the next piece. If higher temperatures are used the piece may be too hot to handle, necessitating automatic unloading. In such a case a conveyor will show some savings over a rotary table, as it can be adapted to mechanical unloading without complicated devices.

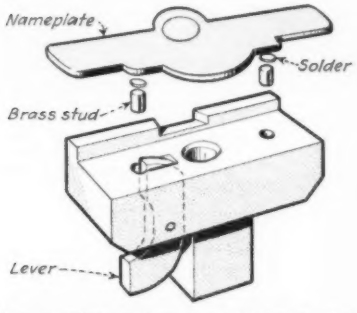
A different situation is encountered with the nameplate shown in another illustration. In this case the material is gilding metal 0.080 in. thick, and two brass studs must be soldered to the back with silver solder having a melting point of 1600 F. The part is finished in vitreous enamel after soldering, and requires firing at 1450 F. The studs must remain soldered to the



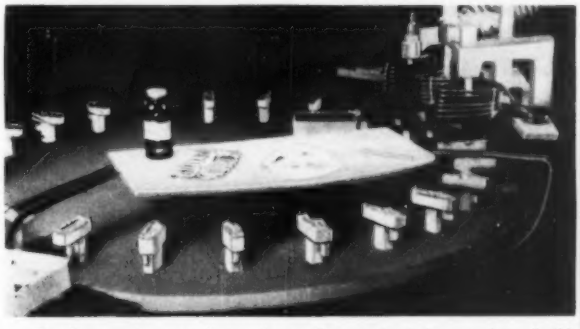
Nameplate with two Carr fasteners is assembled by soldering at 400 F. Spring-loaded lever pushes plate into V of fixture to maintain alignment with fasteners during cooling cycle



Pressure rods hold plate in close contact with fasteners during heating and cooling cycles. Additional pressure during heating is obtained by placing a 6-oz weight on top of the rod



Compensating fixture for high-temperature soldering permits one stud to move as the plate shrinks on cooling. Assembly is vitreous enameled so solder must withstand firing



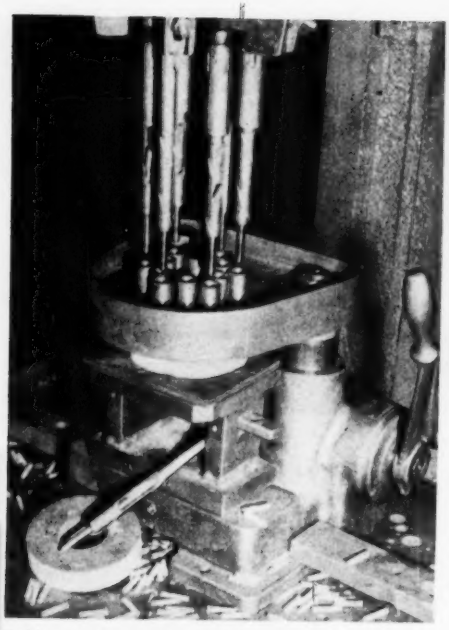
Heating cycle uses three stages for gradual temperature build-up to avoid distortion. Pressure rods maintain contact between plate and studs at each stage, with additional weight at final stage

plate during firing, as it is not practicable to attach them afterwards because even low-temperature soldering would chip and crack the enamel.

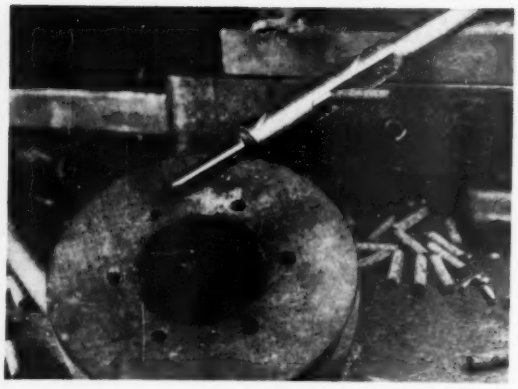
Stud spacing is 2.00 ±0.005 in., and a 90° angle must be maintained. The first problem is to produce a heat pattern to bring the cold piece up to the solder flow point of 1600 F in easy stages. As gilding metal melts at 1850 F, the margin between this and the solder flow point is none too great, and the varying width of the plate complicates things still further. The difficulty has been overcome by using three, six-turn, elliptical coils to produce a slow temperature rise without distorting the work, arriving at the solder flow point at the end of the cycle in the third stage.

The second problem is to maintain correct spacing and angularity in the studs. At 1600 F, maximum expansion occurs in the plate, but as soon as the heat is turned off, the solder sets up almost instantly. This means that contraction in the plate continues long after the studs are firmly soldered, causing them to move toward each other. To compensate for this, one stud is permitted to float in the fixture but is restrained by a weighted bell-crank lever.

At assembly, the two studs are placed in holes in the fixture, the one at the left being held by the lever. A solder prefab disk (0.010 x 0.120 dia) is placed on top of each and is held by flux. The plate is positioned in the fixture by pushing it as far to the left as possible to take up the 0.008-in. clearance provided. All contraction will then take place toward the right in which direction the left-hand stud is free to move. Production is 320 pieces per hr with one operator, scrap losses are virtually nil, and the fixture required no repair and showed no deterioration after constant subjection to the high soldering temperature. It is expected to last for several years.



Rubber, cork, or other soft compositions as thick as 1 in. are cut by changeable hollow drills as large as 1-in. dia. Multi-spindle setup here cuts gasket; drill also can produce composition bumper pins, which feed out of side slot, to 0.001-in. tolerance. Soluble oil improves cutting action



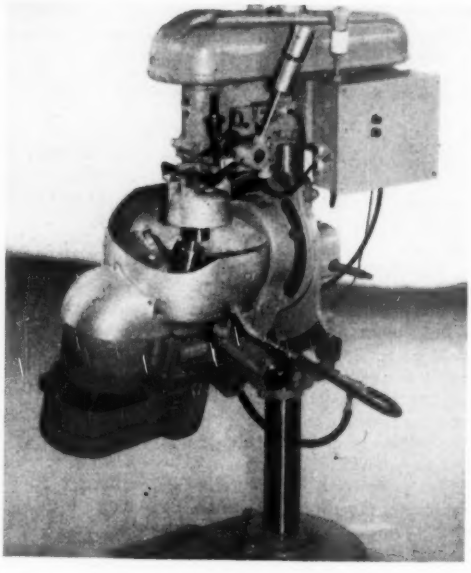
HOLLOW DRILL "POPS-UP" NON-METAL SLUGS

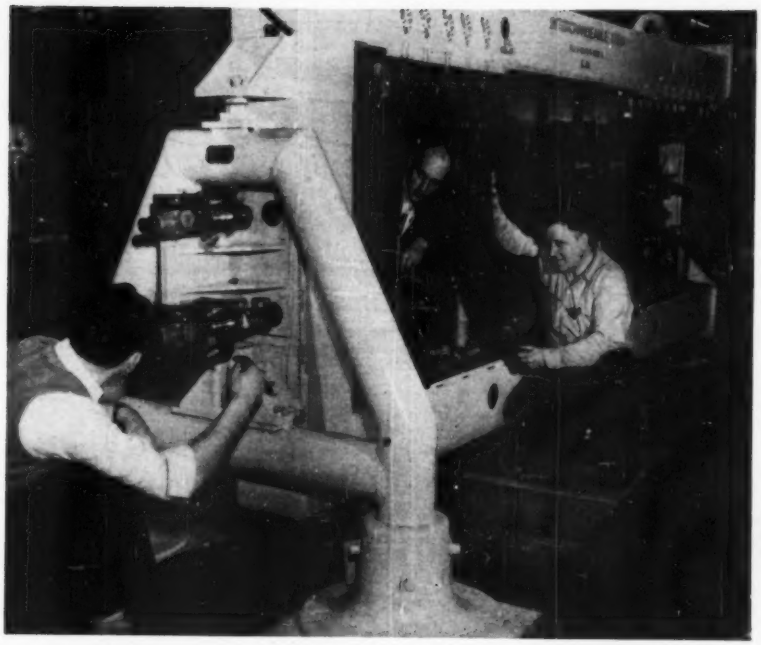
Bevel-edged drill fits into oil-grooved holder that acts as guide in drill bushing. Drill is rotated at 100 sfpm. Tip is hardened to 60R_c; has bevel on outside instead of inside (*AM*, Dec 25 '50, p 120). *Westinghouse Electric Corp. (Elevator Div.)*

TALENTED ☆ TOOLING

DUPLEX DRILLPRESS GENERATES LENSES

Production lapper made by adding Emerald motor, lower spindle, coolant lines, and precision-switch controls on feeds to Delta drillpress operates semi-automatically. Brass ring chuck on lower spindle holds lens blank against rubber pad. Upper spindle rotates diamond-impregnated cupped wheel at 4000 rpm. Tilting for various curves is done with slotted rotary table. Lamp on head indicates when full depth has been reached by lighting up. Machine was developed by Shuron for exclusive use. *Shuron Optical Co.*

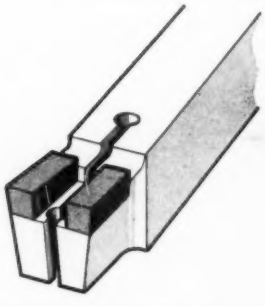




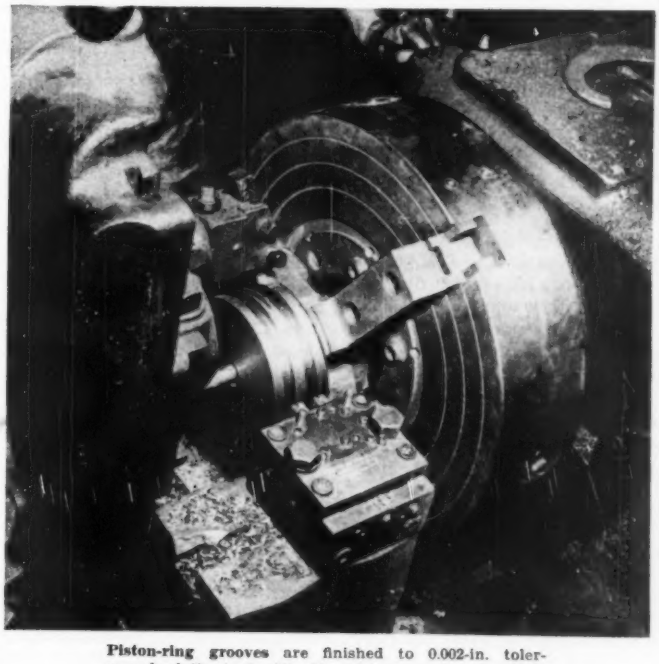
SIMPLIFIED OPTICAL ALIGNMENT CHECKS B-47

Optical alignment jig with built-in telescope and target, and with component positioners on heavy frame, allows placing inspection fixture on springy balcony floor. Older method used transit; couldn't hold 0.0002-in. accuracy as this does. Semi-skilled operators can handle equipment, which saved 30% in tooling costs. *Boeing Airplane Co.*

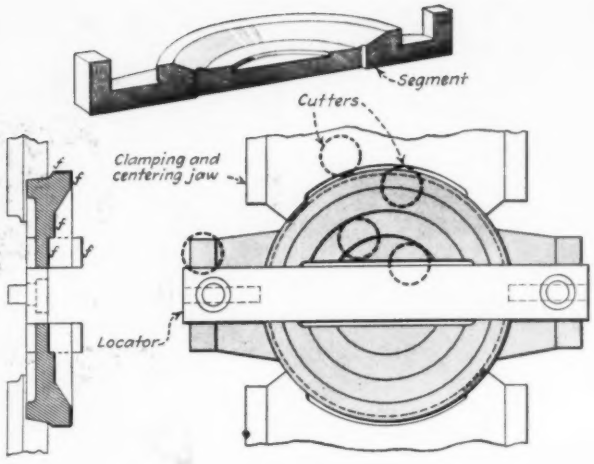
CARBIDE SPLIT BIT ADJUSTS FOR CUT WIDTH



Steel toolshank is split and has tapered hole to take tapered pin. Driving pin into hole spreads the standard inserts of Carboloy 44A to finish grooves. Tools are made for ⅝- to 1-in. grooves. *Carboloy Co.*



Piston-ring grooves are finished to 0.002-in. tolerance by lathe tool with side-cutting inserts after they have been plunge-cut to depth. Short runs on cast-iron piston heads allow accuracy despite vibration



Two segments are properly located in the two-position chuck or fixture by means of a locator or spacing bar and two centering and clamping jaws. One cutter mills the height of the lugs on the ends of the segment, the other four cutters sweep circular paths. One of these cutters mills a cylindrical surface, the other three mill surfaces that lie in vertical planes. Milling gives desired finish and does not round the ends of the piece

CONVERTED CHUCKER MILLS 5 SURFACES

For greater production and better finish, milling would be better than turning. The problem was to devise a machine that would handle the job at least expense

SOME YEARS ago we had to devise a faster method than profiling for machining a number of segments. Since these parts did not contain the radial center, we would have to mount two of them in a special chuck. But there were three reasons why we disliked turning them. In the first place, the interrupted cut would cause objectionable rounding at the point of first contact with the tool. Second, turning would not give a sufficiently smooth surface on the outer radius. Third, we wanted 60 to 80 pcs per hr from two machines, one operator, whereas the best estimate for two chucking machines was 30 pcs for the same conditions.

By milling the pieces, we knew that we could get both the production and finish desired. But how could we get a five-spindle milling machine without going to the expense of a special design?

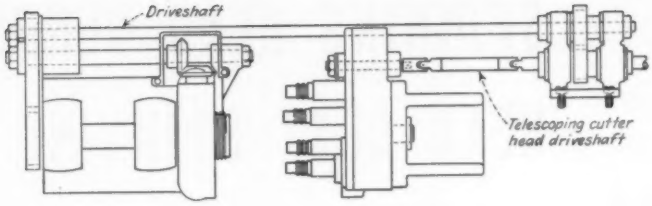
In talking over the problem with the shop superintendent, it was decided that we could probably convert old Potter & Johnston chucking machines. Our basic need was a machine with a traveling turret slide operated by a cam drum in the base. If necessary the cam could be altered easily. By mounting a special chuck on the spindle and driving it at a suitable feed rate, we could sweep the five surfaces on the segment by shell end mills on the five spindles of a cutter head mounted on the turret slide. The turret revolving dog would be removed. Appropriate gear trains and brackets would be designed to convey power from existing gears on the machine and reduce speeds to values consistent with the desired work feed and cutter speed.

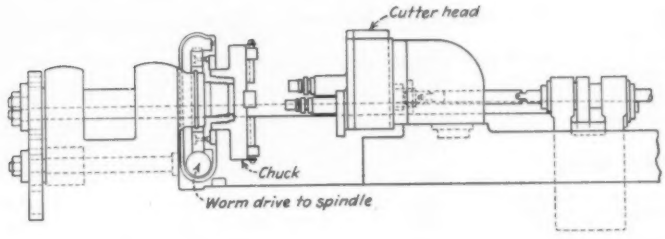
Conversion Details. Power was taken from existing gears at the left end of the machine. Through a gear reduction at this point, two driveshafts are powered. One driveshaft runs to a gear-reduction bracket at the right-hand end of the machine, back of the turret slide. This gear train in turn powers a telescoping driveshaft for the cutter head. Universal joints are fitted to the cutter-head driveshaft, and the telescoping feature permits cutter-head travel of 2⅝ in.

The second driveshaft powers a bevel-gear and wormdrive reduction connected to a special assembly that rotates the spindle at the desired feed rate of 16 ipm. In this assembly, the worm wheel is bolted to a casting that is screwed onto the spindle nose, and in turn has a thread for attachment of the two-position work fixture or chuck.

The cutter head consists of a gear train with suitable ratios to drive the five spindles at the desired speed of 250 rpm. A system of oilers permits application of lubricant to the stub spindles.

With this type of conversion, we were able to realize the required output of 80 pcs per hr per pair of machines, taking a cut of ⅛ in. in cast iron. Four converted machines ran for a number of years on this job.



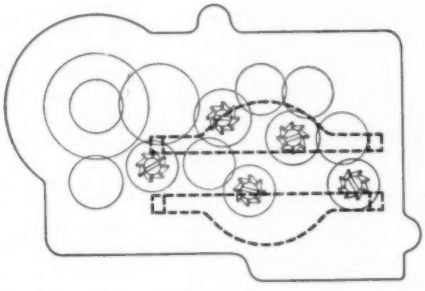


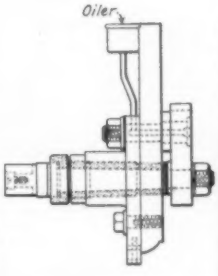
Power was taken from the existing gears on the Potter & Johnston in order to rotate the spindle at the correct milling-feed rate and also for driving the cutter head placed atop the turret slide

ON SEGMENT

BY B. P. FORTIN, SR.

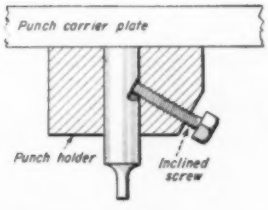
Cutter-head spindles are arranged so that shell end mills will sweep the circular paths required on the two segments shown by dash lines





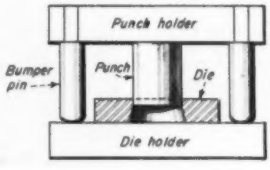
DIEMAKER'S KINKS

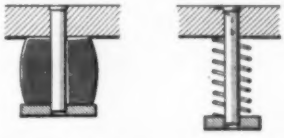
BY FEDERICO STRASSER



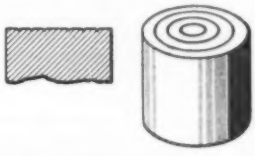
QUICK-CHANGE PUNCHES have two advantages. First, there is no need to peen the head for locking or to turn the punch from a larger piece of material. Second, the punch can be replaced without dismantling the punch-holder plate. The inclined screw prevents the punch from pulling out when stripping.

BUMPER BLOCKS or pins serve several useful purposes: (1) avoid damage to stamps and fragile punches, (2) prevent closing the die too much in storage, (3) help in setting up the die. Make the pins of aluminum or steel. Use an even number of them symmetrically distributed. Sometimes, they are used as rings on guide posts. When grinding the die, grind off the same amount from the bumper pins or blocks to maintain the height relationship between die and punch.





EMERGENCY STRIPPERS for single piercing punches can be made by job shops from music-wire springs, rubber and cork.



CONCENTRIC CIRCLES cut into the face of a shedder in a compound die act as a warning to the operator if the workpiece has not been ejected. If the operator does not see the circles he is warned to stop the press.

Swivel-hook assembly for plastic dog leash is made complete on 4-slide machine. Material is 0.135-in. steel wire, partially annealed

SPINNING HEAD SENDS HEAD COST SPINNING

75% reduction in job cost results when spinning attachment on 4-slide machine forms head on two-piece assembly

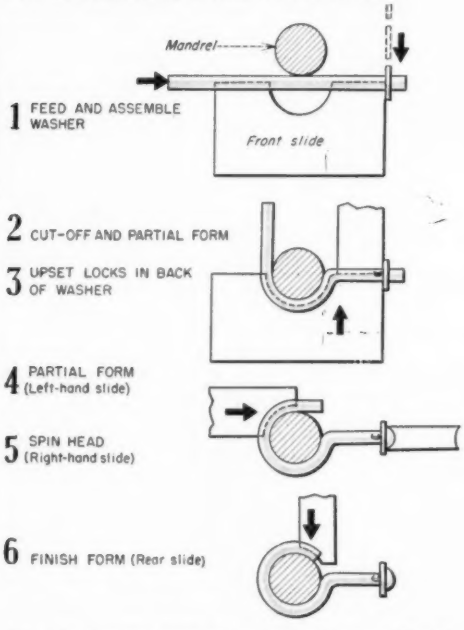
BY CHARLES J. SABO
ALLIED DIE & MACHINE CORP., Union City, N. J.

WITH a spinning attachment on the right-hand slide, a standard 4-slide machine now completes a swivel-hook assembly in one setup, replacing hand assembly methods and doing the job at one-quarter the former cost. The spinning attachment, which forms a head on the hook assembly, also permits the job to be run on a much smaller machine than would be possible if conventional dies were employed.

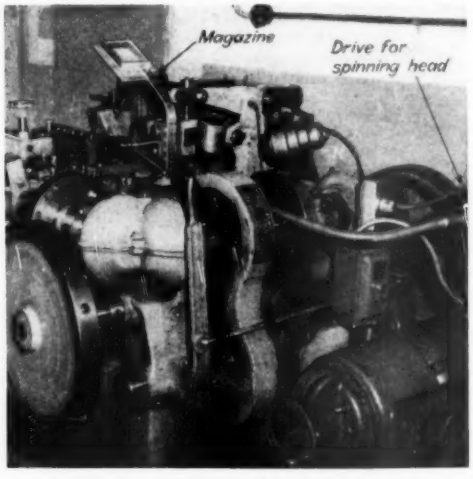
The job consists of a flat steel washer assembled on 0.135-in. steel wire headed on one end and formed into a loop at the other end. The washer must be positioned at the headed end, also must be free to rotate. To prevent the washer from sliding toward the loop two locks are upset on the wire. To permit the washer to rotate freely, spinning must be controlled so the dimension from the upsets to under the head is a few thousandths more than the thickness of the washer.

The spinning head is a standard Grant unit converted for application on the machine. To position the spinning rolls on the centerline of the wire and

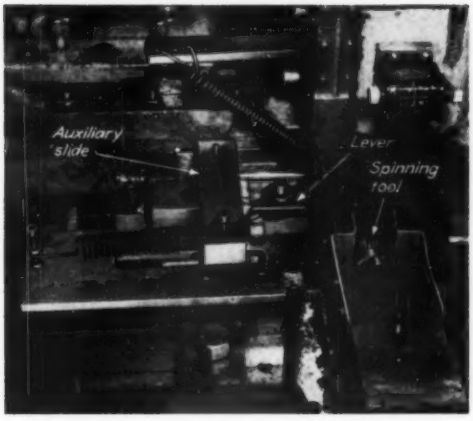
SIX OPERATIONS MAKE SWIVEL HOOK

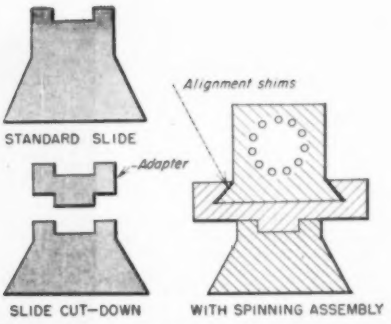

Mandrel
1 FEED AND ASSEMBLE WASHER
Front slide
2 CUT-OFF AND PARTIAL FORM
3 UPSET LOCKS IN BACK OF WASHER
4 PARTIAL FORM (Left-hand slide)
5 SPIN HEAD (Right-hand slide)
6 FINISH FORM (Rear slide)

Operation sequence includes four major features: Washers are fed automatically from magazine; wire is upset behind washer; heading is performed with spinning tool; and forming is done around hardened steel mandrel that also insures alignment of wire and washer



Four-slide machine has spinning attachment mounted on right-hand slide to head wire after washer has been picked up by wire as it feeds past magazine. Spinning head (not visible) is driven through flexible shaft by 1750-rpm motor mounted on steel plate attached to drive motor of machine



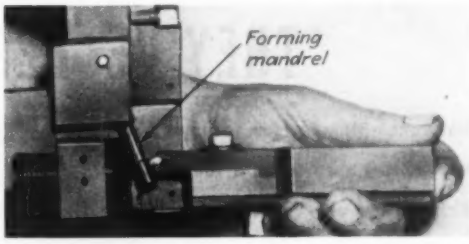


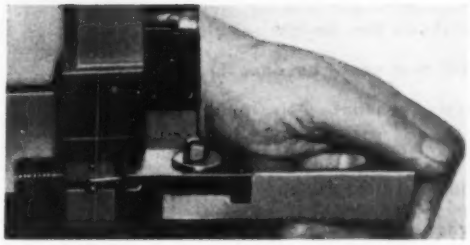
Spinning head is mounted on right slide altered to provide sufficient space to get tool on centerline of wire. After piece is completed, auxiliary-slide assembly positions forming mandrel for stripping and for next feed stroke. Lever releases washer from magazine

yet have room enough to support the bearings of the head properly, the right-hand slide has been altered. The standard slide has been cut down, and grooved so an auxiliary slide can be mounted on it. This not only reduces the height of the head but also provides a lateral adjustment for bringing the rolls directly on the centerline of the wire. The fit of the basic slide in its ways is not affected and, when the press is changed-over to jobs requiring conventional tools on the right-hand slide, an adapter restores the slide to standard height and provides the conventional tool-mounting surface.

A special cam provides a 3/16-in. rise in approximately 50° of cam surface. Rate of rise is constant. The spinning rolls are standard but must have the right lubricant for long life. Initially, metal was picked up on the rolls, and only 9000 pieces could be spun with one set of rolls. At present, however, with White & Begley 1956—a lubricant for spinning rivets—approximately 200,000 pieces can be headed with one set of rolls.

Other features of the setup include automatic feed of the washers into the assembly position and a special auxiliary slide that insures stripping of completed pieces and alignment of wire and washer.





Mandrel positions—During feed stroke, forming mandrel is held against wire, top, to insure alignment with washer. During forming, mandrel is in back position, below, shown as front slide makes first bend in wire

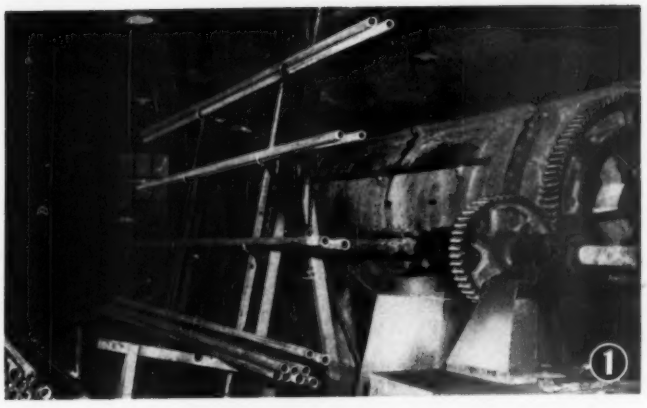
Magazine Feeding

As shown in the operation sequence, the washer is picked up as the wire feeds forward. Washers roll into the assembly position by gravity, being released from a magazine by a lever actuated by the front slide. Washers are supported within the magazine by two pins. One is fixed and, in addition to supporting washers, acts as a pivot about which the lever swings. The other is a press fit in a hole at one end of the lever. At the opposite end, a spring holds the lever in position to prevent the feeding of washers. As the front slide comes in, it raises the lever momentarily to release one washer.

As total clearance between wire OD and washer ID is only 0.004 to 0.006 in., a spring has been added to pull the forming mandrel back against the wire during the feed stroke. This holds the wire in the feed track and insures alignment with the washer.

However, after all forming is completed, the hook assembly remains wrapped around the mandrel in position to jam the next feed stroke. This is overcome by an auxiliary slide that moves the mandrel approximately half-way to its forming position, permitting the stripper to act and holding the mandrel clear of the wire-feed track until the tip of the wire has fed past. The slide then retracts, permitting the spring to pull the mandrel against the wire during the major portion of the feed stroke. The auxiliary slide is advanced with a special cam fastened to the hub of the front cam. A spring provides the return motion.

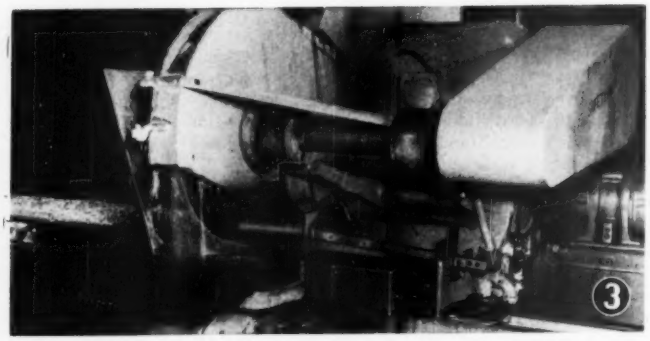
With this setup, approximately 2500 complete assemblies are produced per hour.



Wet-cleaning in 24-ft Draper machine is first step. Flues are delivered on flat cars, then hand-loaded on eight sets of hooks carried by endless-chain escalator powered by small air motor. These lift flues to adjustable arms at top, which roll them into tank at 15 per min. Cleaning cycle is 2 hrs at 21 rpm under constant water wash. Tank is mounted four ft off floor so flues can be discharged by gravity

THEY'VE BEEN MECHANIZING ON

Flue-reconditioning for locomotive boilers used to be a tough, dirty job in any railroad shop; but the New York, Chicago, and St. Louis line thought something different could be done in the new Conneaut, Ohio, plant. It could, and it was: These materials-handling devices are somewhat unusual among railroad-maintenance equipment



Sawing with water-flooded friction blade in Kling machine is started by switch and solenoid valve connected to work stop. Air cylinder depresses sawblade arm, then cam reverses arm to return it. Same cam reverses conveyor to draw flue back and operates cylinder that kicks scrap into tote pan. Flue feeds by gravity to welding station

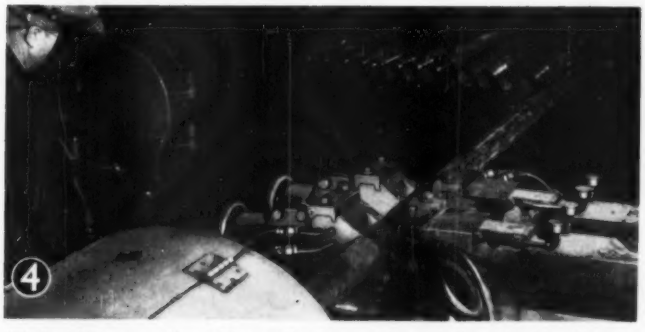
Preheating for swaging operation starts as soon as flue comes to end of roller conveyor (left, rear), where an air cylinder lifts it onto transporter. Firebox end moves along 6-ft gas furnace, reaches 1100F, then drops onto roller conveyor that feeds it into the Ryerson swager

LOCOMOTIVE FLUES are long tubes, ranging in diameter from 2 to 5½ in., and in length from 14 ft to 20 ft, 8 in. In a fire-tube boiler, they span the water space between headers, passing the hot gases from the firebox to the stack. Under these conditions, a set of flues will last only as long as their ends closest to the fire—the firebox ends—are in good condition. However, the flues can be reconditioned to be installed again. The flues are cleaned, inspected, sawed off at the firebox ends, flash-welded to add new ends, upset and rolled, pre-

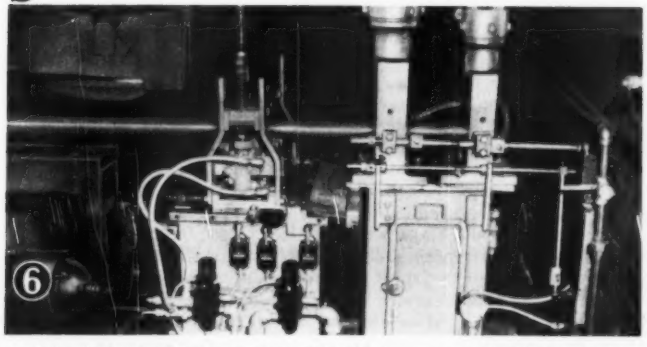
Transfer from cleaner to saw that cuts off flue ends is done with gravity-feed down ramp, then a second escalator lift. This raises and drops flues, one at a time, onto levers that operate switches to stop escalator motor and start gearmotor that chain-drives roller conveyor. Flue drops off lever onto rollers and is fed in to stop on saw table

THE RAILROAD

BY WALTER RUDOLPH



Flash-welding operation adds new fire box end to each flue. Workhandling is mainly manual here, with the operator setting the flue into the 200-KVA Swift welder, then controlling the upsetting and rolling operations. From the welder, the flues are loaded on a roller conveyor that transports them to the other end of the shop



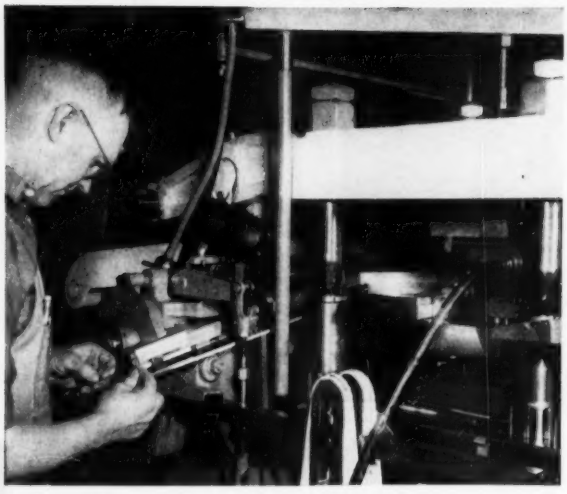
Swaging table lifts flue from rollers, grips it between pyramid rollers that feed it into swaging head (right). Switch reverses the table and conveyor to withdraw the flue. Yoke arms raise flue onto gravity-feed rack that directs it to a flat car, ready for shipment

heated and swaged to fit into the headers.

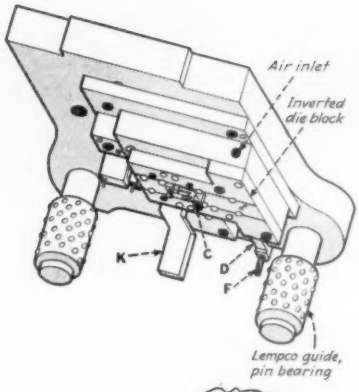
At the U-shaped, 92 by 50-ft Conneaut shop, the actual operations are not much altered from conventional practice; but the handling between operations and during operations is one of the most completely mechanized setups in existence. Generally, the equipment is chain-driven paddle or hook conveyors, roller conveyors that are chain-driven, and tilted racks that feed the flues by gravity. A few air cylinders, especially at the cutoff saw, are utilized, and a large number of 1-hp motors are installed to drive the conveyors.

Actuating mechanisms are generally solenoid valves and precision switches operated by levers that are hinged so the flues will depress them as they pass over en route to the next operation. Reversing switches are installed to back the flues out of the saw and swaging machine as soon as those jobs are done. Thus, mechanization has cut out most of the manual handling at the machines, and practically all of it between machines, except at the start and finish of the line.

Complete mechanism of the reconditioning line would probably be impossible, but with the present equipment, only four or five men are required to produce a finished flue every 34 seconds.

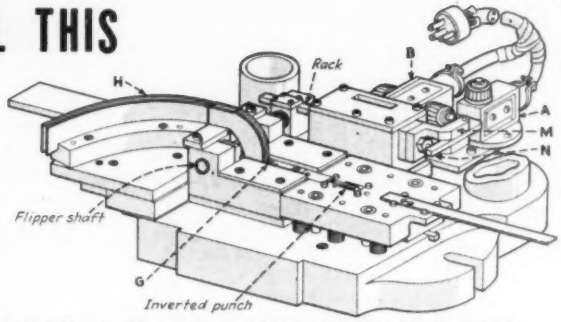


Contact springs are discharged onto slide rails, from whence they are easily loaded onto hairpin-type racks. Bag collects slugs blown from die



SWITCHES CONTROL THIS PROGRESSIVE DIE

BY P. R. ENZLER,
Superintendent, Micro Switch Div. of
MINNEAPOLIS-HONEYWELL REGULATOR CO.



Snap-action switches shut down the machine if a blank sticks in pressure pad *C* or a misfeed prevents the flipper *G* from pushing a finished blank out of the strip and into the slide rails

WE USE a progressive die to make beryllium-copper contact springs for our Micro snap-action switches. Because this tool is operated at 175 to 190 strokes per min. in a 50-ton Henry & Wright dieing machine, we must have means to prevent accidental die damage.

Punch and die sections are inverted, except that the forming punch is attached to the upper member. This construction puts the burr on the desired side of the part, permits carrying the blank along in the strip, and allows forming downward.

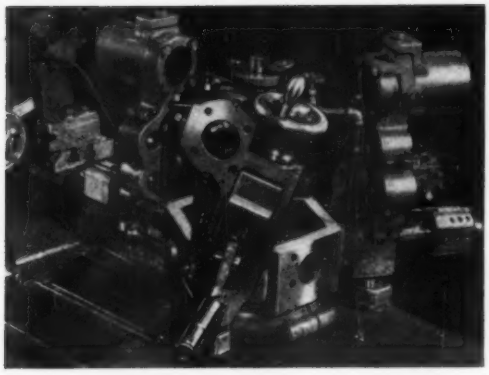
Micro snap-action switches *A* and *B* prevent malfunctioning of the die in respect to two possible conditions. Switch *A* shuts down the machine when the spring-pressure pad C becomes jammed with more than one spring blank. This pad is attached to switch-actuating lever *D*, which is fitted with an adjusting screw *F*.

Switch *B* shuts down the machine if the flipper *G* fails to remove the formed part from the strip and place it on the slide rails *H*. This protection is brought into play when the vertical cam *K* engages the slide attachment *M*, which is spring loaded against a rack. The rack under normal conditions rotates the flipper shaft.

If the flipper plate becomes inoperative due to misfeed or other causes, the slide assembly continues to travel under spring pressure, but the rack and a pin are motionless. Now, the switch actuating lever *N* closes switch *B* to shut down the machine.

Pre-adjustment of adjusting screw *F* and of lever *N* can be so fine, that any slight malfunctioning of the two mechanisms will close their respective normally open switches, and a solenoid will be energized to trip the machine starter. After the difficulty is corrected, the machine can be set for re-run by manually resetting the switch on the problem position.

Originally, the part-ejection flipper was actuated by an air cylinder, but now a cam-actuated slide is used to maintain correct timing at high press speeds.



THE WHY AND HOW OF
Automatic Turret Lathes
FOR CHUCKING WORK

BY MILES J. ROWAN, Associate Editor

Included in this report are single-spindle chuckers with indexing turrets. In common with all automatics, these machines offer exceptional opportunities for increased productivity and better utilization of manpower on the class of work for which they are suited. This includes a broad range of jobs on which both internal and external operations must be performed and where savings can be made by performing a large number of operations in one setup. Work as large as 72 in. can be done and, on some pieces, as many as 23 tools are brought into action in a single setup. In many cases, these automatics are applied to jobs on which production is high and machines can be tooled for a given job. However, modern machines include numerous setup features that often permit even relatively short-run jobs to be run on the automatic. While most of these features involve pneumatic, hydraulic, or electric controls, the setting of these controls is made mechanically and can be grasped readily by men of the caliber ordinarily selected for setup work. As these features broaden the usefulness of the automatic turret lathe and thus offer management an opportunity for savings that may not be fully appreciated, this report discusses not only the operation and tooling of the machines but also the methods by which automatic control is established over their cycles. Both horizontal and vertical machines are described, with separate sections for each type.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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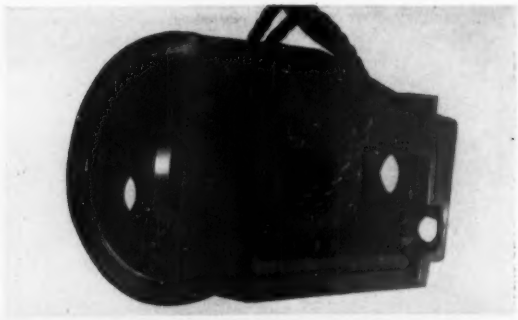
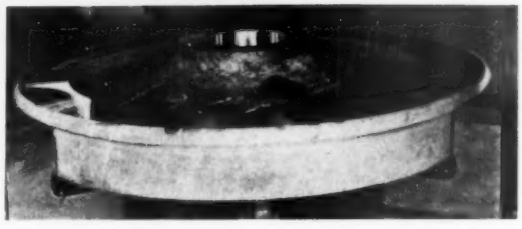




Automatic-turret-lathe jobs range from small, light objects to bulky parts weighing several hundred pounds. Castings, forgings, and cut-off bar stock can be machined, often with heavy multiple cuts by carbide tools at high rates of metal removal

Why An Automatic Turret Lathe?

AUTOMATIC TURRET LATHES are well-suited for chucking jobs on which both internal and external operations must be performed. Because of the number of tool positions available and the opportunities for multiple cuts from each position, a large number of tools can be brought into action in one setup, often eliminating second operations and the need for rehandling. As both inside and outside surfaces can be machined at the same time from the turret, the time of several end-working operations often can be saved. Furthermore, side-working operations are performed while the turret tools are cutting and seldom require additional time over that required for the turret cycle. Much the same can be said for the hand turret lathe and, for the most part, the factors that determine a good turret-lathe job apply equally well whether the machine is manually operated or automatic. However, several other factors determine whether the job should be a manual or an automatic operation.

For example, the time for making one piece on the automatic may be no less than the time required by a skilled operator to make the same piece on a manually-controlled machine. At the end of the day, however, production from the automatic often is double that obtained from the hand machine.

Repeats Cycles Without Error

The increase results partially from the elimination of most of the fatiguing manual operations required on a hand machine. The remainder of the increase usually comes from the fact that the machine can be set up for the best speed and feed conditions for critical cuts and once set up will duplicate these conditions on every piece. It automatically makes the changes in speed and feed that permit getting the most out of the tools and out of the machine. While even more changes normally can be made on a hand machine, there is always the danger that the operator will not make the changes and thereby will fail to realize the full potential of his machine.

However, even if the same production could be expected from either machine, the automatic offers an opportunity for lower labor cost per unit as one man often can run two or more machines. In setups of this kind, a casting may be machined on one end in one machine, then reversed and machined on the other end in the second machine. However, the jobs can be entirely different. The major requirement is that the machine cycle times be properly balanced and the production quantities sufficiently large to justify the setup.

In this regard, the automatic turret lathe fills the need for a machine between the hand turret lathe and the multiple-spindle chucker. The latter is a high-production machine, while the former is excellent for job-lot orders. For medium-and long-run jobs, the automatic turret lathe is indicated. However, at the present time there are several machines that have been designed for fast, easy setup and these machines make it profitable to run jobs on an automatic in lot-sizes that are surprisingly small. As a result, the automatic turret lathe offers opportunities for increased productivity and lower cost on chucking jobs produced over a range of lot-sizes that at either end approaches the two extremes of quantity requirements.

Horizontal Automatic Turret Lathes

...HOW THEY WORK AND HOW THEY ARE SET UP

THE BASIC operating cycle on horizontal machines includes for each turret station: rapid advance, feed, dwell if required, rapid return, and index to the next station. While the turret goes through these motions, the cross-slides advance, cut, and return. End-working operations, including turning, drilling, boring, reaming, counterboring, chamfering, and threading, are performed from the turret usually with two or more operations performed simultaneously. Facing, grooving, chamfering, and forming are performed from the cross-slides. By a combination of turret and cross-slide motions, or through attachments or special tooling, a number of other operations can be done. These include form and taper turning and boring, recessing, back facing, recess boring, back turning, spherical boring, contour turning, and multiple drilling of holes not on the centerline of the work.

Standard cross-slides move only back and forth at right angles to the spindle during the automatic cycle. However, they can be adjusted longitudinally during setup and several models also have T-slots to permit further positioning of the toolholders relative to the work. While one manufacturer has a bridge-type cross-slide for all models except the smallest, other builders provide independent cross-slides.

Machines with the bridge-type cross-slide normally are set up so the front slide operates with the first turret face and the rear slide with the second turret face. This timing can be changed, however, to permit operation of the cross-slide with any two consecutive turret faces. On machines with independent cross-slides, either or both cross-slides can operate with any or all turret faces. With either type, the turret and cross-slides normally operate together and all tools operating during any one stroke end their cuts simultaneously. However, this relationship can be changed, if necessary. On some machines, the cross-slides can end their cut before the turret reaches its point of maximum advance. On others, the cross-slide can feed while the turret dwells. Feed rates usually are the same as the feed on the turret but can be different if special cams are provided.

Length of Stroke

The length of stroke on each cross-slide and on all turret faces can be set independently to suit the requirements of the job. Once set, however, each cross-slide advances to the same position at the end of its feed stroke regardless of the number of turret faces with which it operates. All turret faces also advance to the same position at the end of their feed strokes. On some machines, this position can be varied during setup. However, in any given setup, relative tool positions at the end of a cut are established by the relative location of the toolholders on each slide and on each turret face.

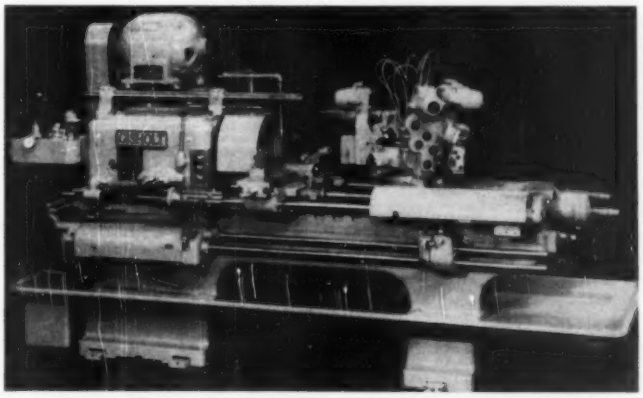
Turrets are 4-, 5-, or 6-face depending upon the machine and the manufacturer. If no tools are needed on one turret face, it is possible to index to the next face without the turret first advancing to the point at which the other faces end their strokes. This reduces the total cycle time.

Machines have a large number of spindle speeds available to satisfy the full range of setups that must be made. For any given setup, pick-off gears give various sets of spindle speeds within which selection is automatic. Changes usually are made during rapid traverse, but can be made during cuts, if necessary.

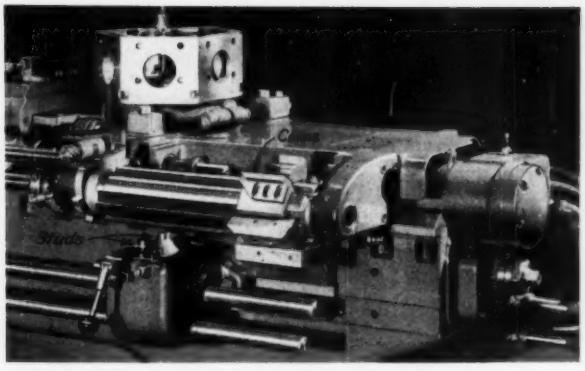
Feed rates that can be obtained on the turret, as well as the methods of establishing automatic control over the cycle, vary with different manufacturers and can best be explained by describing the major types of horizontal machines separately.

Turret in Conventional Location

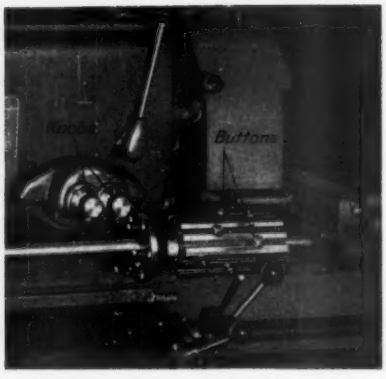
Similar in appearance to hand turret lathes are automatics with a turret that indexes in a horizontal plane around a vertical axis. Machines of this type are produced in a range of sizes accommodating work from only a few inches diameter up to 49 in. and providing a feed stroke from 4.5 in. on the smaller models up to 18 5/16 in. on the largest standard machines. To



Automatic turret lathe is one of several models with turret that indexes about a vertical shaft. This machine has 6-face turret and independent cross-slides, but others of this type also may have 4- or 5-face turrets and bridge-type cross-slides. Except for loading and unloading, all operations are performed automatically by the machine without operator effort



Feed-control cams are positioned longitudinally on drum to determine point at which machine changes from rapid traverse to feed rate and transversely to determine rate of feed. Cams advance with turret to act on studs controlling hydraulic system that provides turret movements



Speed-control buttons on 6-sided drum that indexes and moves with turret turn knobs controlling hydraulic cylinders. These operate clutches to change spindle speed within range of internal and pick-off gears selected for job

meet particular job requirements, machines with greater stroke also have been built.

Hydraulic Turret Feed

On one line of machines, the turret is operated hydraulically and feeds are infinitely variable within a usable range. The position of control cams on a 6-sided drum that indexes with the turret and is carried back and forth by the turret saddle, determines both the point of change from rapid traverse to feed and the feed rate. These cams actuate control rods on pumps supplying the cylinder that moves the turret. Cams are slotted to permit adjustment and normally do not have to be removed from the drum. A different feed rate can be provided on each turret face and with a standard cam of the proper shape any combination of increasing or decreasing feed rate can be obtained.

Spindle speed is controlled by the position of buttons on a second 6-sided drum that also rotates as the turret indexes and moves longitudinally with the turret saddle. These buttons engage knobs controlling a hydraulic gear shift and, as the turret advances shift the headstock as required.

Geared Turret Feed

A second manufacturer drives the turret with a cam in the turret end of the base. The feed rate is determined by gearing driven from the spindle so feed rates vary directly with spindle speed. A large number of feeds are available through change gears and multiple-disk friction clutches. These can be shifted automatically to provide three, and an on some machines four, different feed rates in any one cycle. At the end of the feed stroke, a rapid-traverse motor is engaged to drive the turret slide at high speed during all noncutting motions of the cycle.

Automatic control over spindle speeds, turret feed rates, shifting from rapid traverse to feed rate, and stopping the spindle, is accomplished by dogs mounted on a drum that rotates in direct relation to the turret slide and makes one complete revolution during each cycle. Speed and feed clutches are operated electro-pneumatically, with operating pistons moved by air pressure controlled by solenoid-operated valves. These are energized by switches located directly over the dog drum and actuated through the dogs. Timing of the various actions thus can be established simply by positioning the dogs properly on the drum.

Two-Spindle Turret Lathe

Designed for high production where job change-overs are infrequent is the 2-spindle turret lathe. With these machines, operations on two pieces can be performed simultaneously. Each turret face has two tool stations to permit full turret tooling for each piece. This may be identical tooling or, if the operations are sufficiently well-balanced, machining may be done on two different parts at the same time. Where this machine is practical, it results in lower first cost, power savings, savings in floor space, and greater convenience to the operator than would two single-spindle machines.

This machine is similar in operation to the machine described in the section on geared turret feed. Because it is based on the same principles and can do the same jobs, it is included in this report which otherwise is devoted entirely to single-spindle equipment.

Turret in Overhead Location

Called a single-spindle automatic chucking machine by its manufacturer, this machine has a turret that indexes around a horizontal axis and that is supported above the centerline of the spindle. This location permits mounting tools that take cuts on the large diameters, where the torque is greatest, with less overhang than tools working on smaller diameters or on the centerline of the piece. It also keeps the turret free of chips. Built in one size only, the machine will swing work up to 8.5-in. diameter and provides a maximum turret working stroke of 6 in.

On this machine, the spindle speed-ranges and the turret feed-rates for a given setup are estab-

lished by pick-off gears. Four different speeds and three feed rates can be obtained in any one cycle. Automatic control over speed and feed changes then is obtained through limit switches operated by trip dogs on a selector drum. This drum is mounted on the opposite end of the shaft that supports the turret.

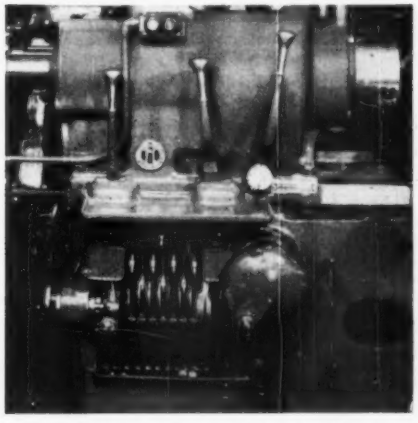
One set of trips determines spindle speed, with the position of the trip on the drums establishing the point in the cycle at which the speed change occurs. A second set of dogs determines both the rate of feed and the longitudinal position at which the turret switches from rapid traverse to feed rate. One or all three available feed rates can be obtained on any or all operating faces of the turret during any machine cycle.

Normally, the turret and either or both cross-slides operate together, with all tools ending their feed strokes simultaneously. However, the machine can be set so either or both cross-slides operate while the turret dwells at the end of its stroke. Either method of operation may be obtained simply by attaching operating screws to an index drum.

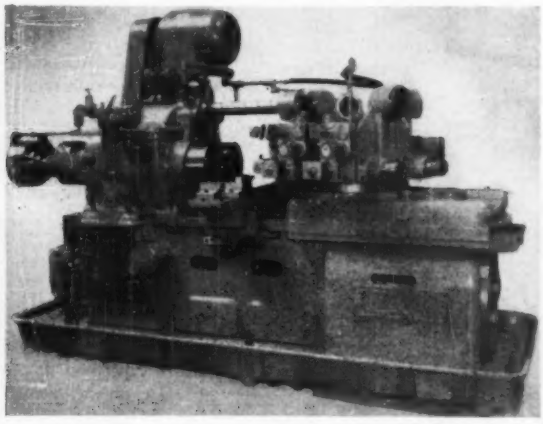
General Features

On some machines, it is possible to end automatic control at any point in the cycle simply by disengaging a lever or turning a switch. The operator then can run the machine through any of its motions under manual control.

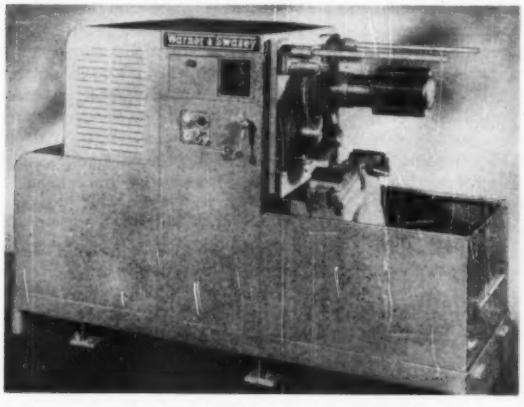
Safety interlocks prevent indexing until the turret has withdrawn to a pre-determined point at which tools clear the work. They also prevent the advance of the turret until indexing is completed. These features reduce the danger of tool breakage from smashups.



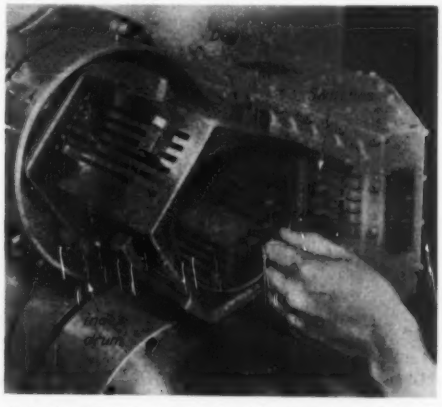
Main control drum for machines of one manufacturer has dogs that can be positioned on drum to actuate switches in correct sequence for full automatic control over cycle



Two-spindle automatic turret lathe has double tool positions on each turret face to do two pieces simultaneously. Jobs can be different if operations are balanced. General operating features are same as on similar 1-spindle machines

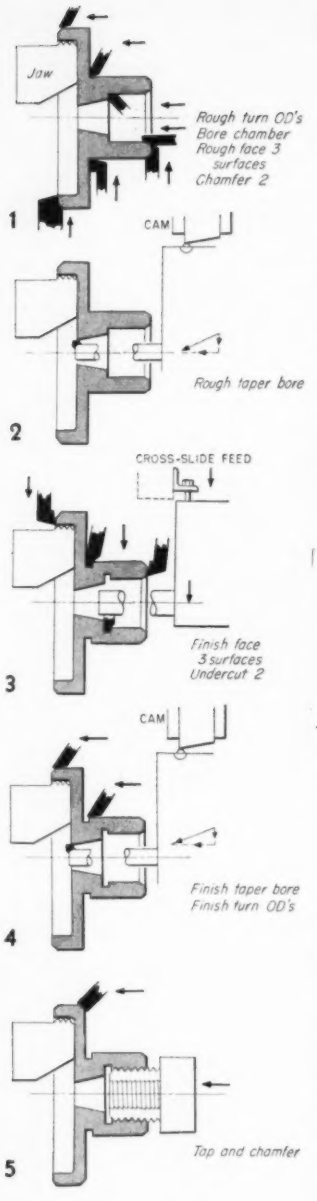


Automatic chucker has turret that indexes around shaft in horizontal position above spindle. Turret has five faces and both front and rear cross-slides are independent. Machine is shown with chip guards removed



Selector drum carries adjustable dogs that trip limit switches to control speed changes, stroke length, and rate of feed. Indexing, cross-slide timing, and dwell are governed by switch screws on index drum

How Are Horizontal Machines Tooled?



21 CUTS IN ONE SETUP

Multiple-tooling gives automatic turret lathes broad capacity for rough and finish machining on many surfaces in one chucking. Machines can do tapers, undercuts, and contours as well as straight internal and external surfaces

ONLY WITH proper tooling can the full production potential of an automatic turret lathe be realized. The objective is to perform as many operations as possible in one setup, thus reducing second operations and rehandling. Operations also must be arranged to give minimum cycle time for the job and top production from the machine. Tool planning, therefore, seeks to bring the maximum number of tools into action at one time, both through multiple cuts at one position and combined cuts from two positions simultaneously.

Standard or Special Holders?

These objectives apply equally well whether tooling is standard or special. Therefore, many standard toolholders can mount two or more tools and, as a result, jobs that require machining on a large number of surfaces often can be done with standard tooling. Where possible, standard holders also are designed for flexibility and, in many instances, basic holders can be used for several different operations. On some pieces, of course, it is not possible to complete all the operations of which the machine is capable with standard tools. If these pieces are produced in large quantities, it often pays to develop special holders to reach surfaces that otherwise are inaccessible or to group several tools in fixed predetermined relation to one another so a number of surfaces can be machined with the stroke of one cross-slide or turret station. Special setups require experienced engineering and usually are developed by the machine manufacturer. However, when the application of standard toolholders is properly understood, many excellent setups can be made with standard tools.

The multiple turning head is a particularly flexible holder that can be applied for many operations performed from the turret. Because of the large number of tool mounting-holes that it contains, it frequently makes possible one or more turning operations in combination with drilling, boring, or other internal work. One hole is provided for drills, reamers, counterbores, and other tools that must be set on the centerline of the work. The remainder of the mounting holes are for turning and boring operations and are spaced so tools can be set readily for several different diameters.

Multiple turning or boring cuts also can be taken with adjustable turning heads. The toolblock is locked in position once the required dimension is reached. Fine adjustments can be made readily with heads of this type.

Straight turning is performed with single-point tools held in straight or bevel stems. For machining to a shoulder or to the chuck jaws, the bevel stem is recommended. Both types also can be undercut, offset, adjustable, or relieving. On the undercut stem, the lower part of the head is recessed to permit cutting diameters that could not be reached with a standard stem. The offset differs from the plain only in that the head extends a greater than normal distance below the centerline of the shank. This enlarges the range of diameters that can be reached with only a minimum extension of the toolbit from the stem. This is particularly important in cutting large diameters where the toolbit must be firmly supported to withstand high cutting torques. The adjustable stem is intended for light, accurate cuts. It consists of a dovetail slide and micrometer screw that permits adjustments to close tolerances.

Eliminate Deflection

When only one tool need be mounted on a turret face, a flanged holder can be used for all common internal operations such as drilling, boring, and reaming. Floating holders are suggested for reamers to overcome misalignment and minor inaccuracies.

If turning and boring stems must be extended an appreciable distance from the turning head, sup-

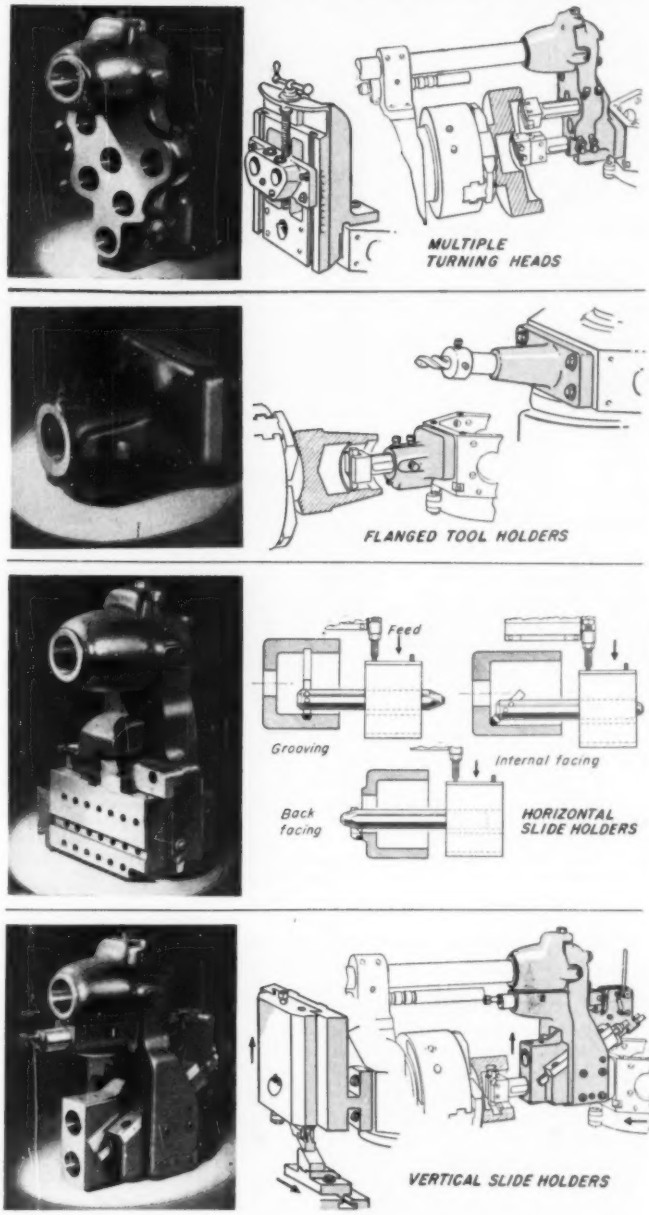
port brackets can be added. These increase the rigidity of the cutter holder and minimize any tendency to "spring" during heavy cuts. Although this is a problem in chucking work, it normally can be overcome with proper setup. Heads on which tools overhang the work can be strengthened with overhead pilots or, on some machines, with guides that support the lower end of the head. Furthermore, because of the large number of tool positions available, rough and finish cuts usually can be taken on critical surfaces. The second pass can be a light cut to provide close dimensional tolerance and good finish. Generally, work can be held to within 0.002 in. for size and 0.001 in. for concentricity, but better results are possible on many jobs if need be.

Horizontal Slide Toolholders

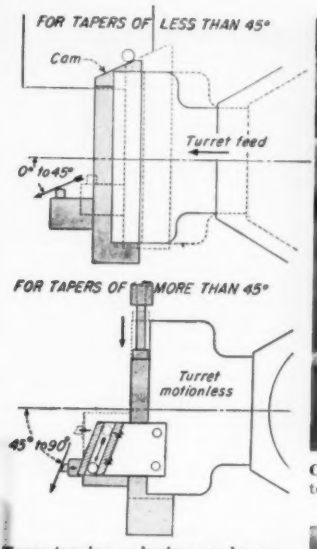
Particularly versatile and capable of performing many internal operations are turret slide tools. Those in which the slide moves horizontally across the face of the turret are for internal grooving and internal facing operations, including plain facing, back facing, and straddle facing. The turret advances to position the tools for the cut, then dwells while the cross-slide, or an attachment on the cross-slide, moves in to feed the tools during the cut. Spring action then returns the tools until they clear the cut and the turret can withdraw. Toolblocks can be mounted in any of several positions to suit the job. Adjustable stops permit close control over the length of cut.

Taper turning and boring can be done with the same tool simply by controlling its movement with a flat cam and roller. The cam may be mounted on the cross-slide and the roller on the tool slide, or vice versa. Cams also can be placed below or above the slide, if these locations are better suited to the requirements of a particular setup. The cross slide remains stationary and, as the turret feeds forward, the toolbit duplicates the shape of the cam. Straight tapers up to 45° with the centerline of the spindle can be cut this way. Contours can

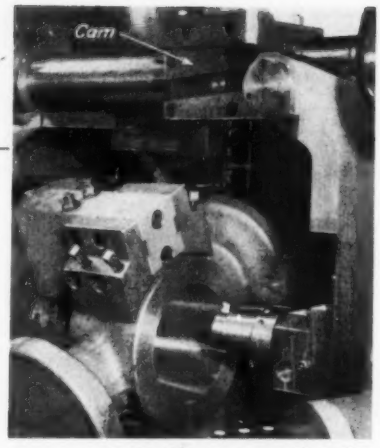
BASIC TOOLHOLDERS CAN PERFORM MANY OPERATIONS



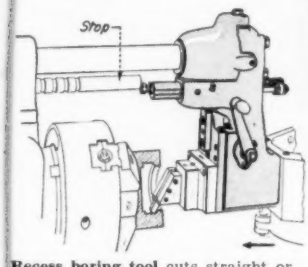
Standard toolholders provide the flexibility required to arrange cuts over the full range of work of the machine. Each holder also can be set for two or more different operations in many cases. Not all standard holders are illustrated and operations shown are only representative. Holders shown, however, can perform the majority of automatic-turret-lathe operations. Holders of different manufacturers will differ somewhat



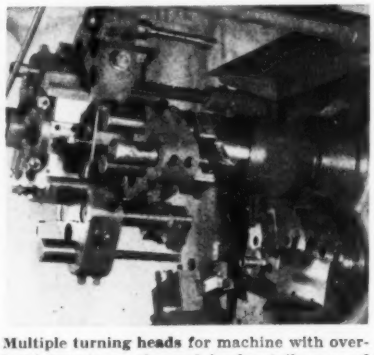
Taper turning or boring can be performed with standard slide tools in combination with simple camming



Cam on overhead pilot actuates vertical slide toolholder for taper-boring operation



Recess boring tool cuts straight or taper bores with cut controlled by shape of cam. Toolbit begins forming when cam bar on tool hits stop



Multiple turning heads for machine with overhead turret are clamped in dovetail ways of turret. Adjustable boring heads and turret slide heads are mounted in same way. Toolbits are held in conventional stems

be done in the same way within the mechanical limits of the roller following the cam shape.

For angles greater than 45°, a sliding toolblock is fastened on the horizontal slide toolholder. A stud on the block engages a cam groove supported above the block. With the turret motionless, the cross-slide moves the main sliding holder transversely across the ways. At the same time, the cam causes the toolblock to move longitudinally and the combined motion results in a taper cut.

Vertical Slide Toolholders

Toolholders in which the slide moves vertically are for internal necking, grooving, facing, and chamfering. These are operated externally either by a section of the holder coming in contact with a stop on the machine or with the work itself. In either case, the principle is to mount the toolblock on an inclined slide. As the main body of the toolholder feeds forward with the turret, the stop prevents forward motion of the toolblock, causing it to travel upward on the slide to perform the operation. The tool is adjustable and can be pre-set to feed the required distance of the cut.

When these toolholders are applied to internal facing or back-facing operations, it sometimes is desirable to avoid spiral tool marks on the faced surface. For the application, the holder is modified to provide automatic relief, or clearance between the tool and the work, while the tool is returned. This is accomplished by spring pressure released from a pre-set trigger.

A second type of vertical slide toolholder for recessing or internal grooving is actuated by a cam on the cross-slide. The turret dwells after it has advanced to the position of the cut and the cam moves in to feed the tool to depth. For these operations, the toolbit is ground to the desired shape. This toolholder also can be set up for taper boring, taper turning, crown turning, and other contour work by attaching a cam of the proper form either below the toolholder or above it on a bracket on the overhead pilot. As the turret advances, the tool reproduces the cam shape in the work.

Recess Boring Tool

Recess boring and internal chamfering can be done with a tool that feeds the cutter to depth with an internal cam that is actuated by a stop on the machine as the turret advances. The cutter is held in a vertical slide. The recess may have a straight, tapered, or curved contour depending upon the shape of the cam bar.

Threading Holders

Axial float is provided in holders for tapping and threading. This compensates for slight differences between the feed rate of the turret and the lead of the thread. In this way, most common threads can be cut. However, whenever threading is involved, it is well to check the available feed rates on the machine and also the class of thread required and the size of the threaded section. Class 2 threads are generally obtainable and class 3 threads on some equipment and some jobs.

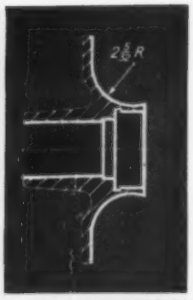
For the most part, collapsible taps and self-opening die heads are employed, as this eliminates the need for reversing the spindle. However, there is a lower limit to the hole size on which collapsible taps are practical. Below 1¼-in. dia, solid taps normally are

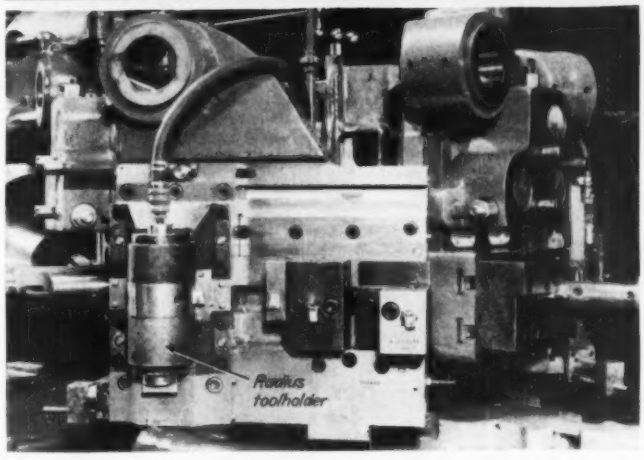
indicated and, on such jobs, some way of backing the tap out of the hole is needed. One manufacturer solves this problem by putting any one of three transmissions in his machine, depending upon the threading requirements of the work for which the machine is intended. One is non-reversing; the second permits reversing when cutting right-hand threads; the third is reversing and can cut either right- or left-hand threads.

However, as reversing is not possible on other standard machines, one manufacturer has developed a special holder that reverses to run out the tap. Another method releases the tap from the holder, permitting it to remain in the work as the turret withdraws. The operator works with two taps, putting one in the tap holder when he chucks the piece and removing the second from the completed piece during the automatic cycle.

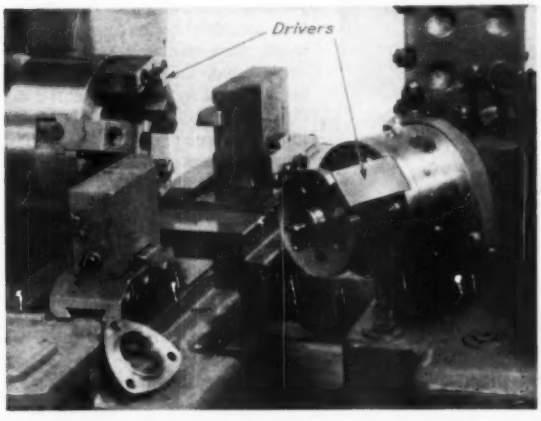
Multiple-Spindle Drillheads

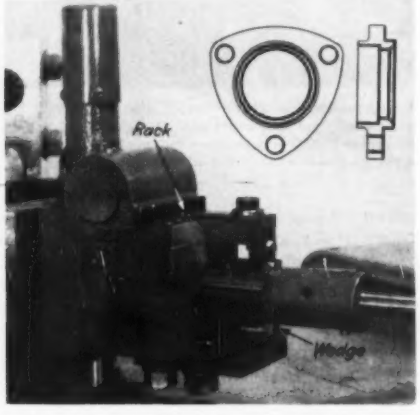
Simultaneous drilling of holes on one or more diameters around the centerline of the work can be done with multiple-spindle drillheads without stopping the spindle. Heads revolve at the same speed as the spindle, and rotate the drills through a central fixed gear that meshes with driving gears on each drill spindle. The turret feed stroke carries the drills to the re-



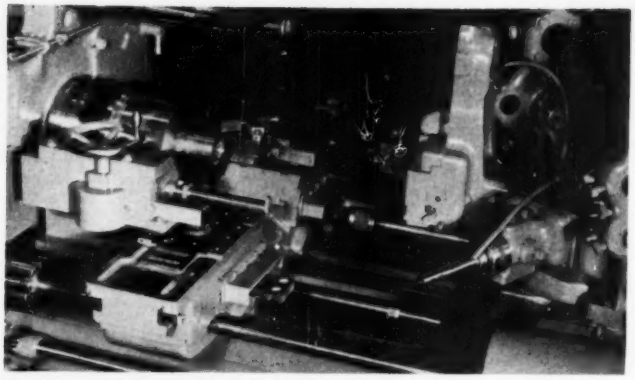


Radius-generating tool blends curved and straight surfaces of 1040 steel forging. Toolbit is held in collar keyed to shaft that rotates to swing toolbit through required arc. Shaft is rotated through gearing driven by rack actuated by cross-slide while turret dwells. Other toolbits are preset to cut simultaneously on three other surfaces as turret feeds to position at which radius tool cuts

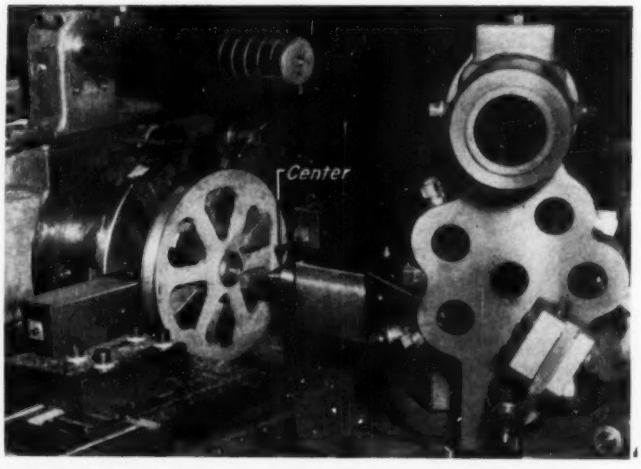




Multiple-drilling head drills three holes in predetermined location on flange. Head is driven from chuck. At right is reverse boring tool that single-points back counterbore larger than hole size of piece. While turret dwells, vertical rack travels upward and through pinion in mesh with teeth in splined bar moves bar toward turret. This raises toolbit to diameter through action of wedge on taper plane which is fixed



Special cross-slide taper-turning attachment is actuated by pusher bar on turret. Internal cam governs tool motion. Machine cycle includes drilling, boring, and pressing a bushing into place. Bushing is loaded on arbor and pressed in by turret feed while spindle is running. Part is aluminum and is machined complete in two operations with total floor-to-floor time of 3.2 min.



Spring-loaded center on turret supports large 4- and 5-groove sheaves while front and rear cross-slides rough- and finish-form grooves. One setup machines 5 different sheaves but center is not needed on 1-, 2-, and 3-face sheaves. Short time interval between cross-slide cuts avoids chatter

quired depth. Holes can be of different size and depth and can be located on different surfaces of the piece. Combination drill and countersink tools also can be employed.

Rotation of the drillhead can be accomplished in either of two ways. One method is to drive from the chuck or workholding fixture by means of lugs mounted on the drillhead housing and the chuck. The driving members engage soon enough to bring the drills up to speed before they contact the work. For small drills a bushing plate is provided. With this method, holes can be drilled in an exact location on an irregular-shaped piece.

The second method is satisfactory on pieces that contain an accurately machined taper bore. A sliding taper bushing on the drill head drives the housing through frictional contact with bore as the turret feeds forward. A stiff brush on the head end of the bushing cleans chips from the hole just ahead of the bushing. This method can be applied only to jobs on which the hole pattern need not be located in relation to any reference point on the work.

Drill heads are single-purpose tools, being built for specific jobs and having fixed center distances. On steady-run jobs, however, the savings through elimination of a second operation may readily justify their cost.

Workholding Methods

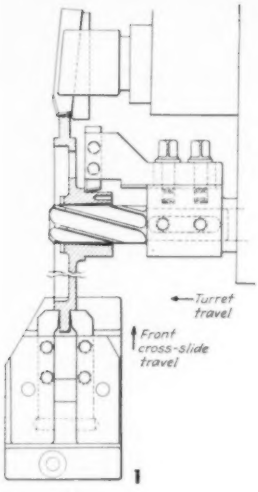
Work usually is held in air-operated chucks or in special fixtures on a face-plate. All manner of workholding methods are employed to suit the variety of shapes that must be machined. Air chucks normally are equipped with a safety switch that stops the spindle if the air pressure drops below a preset limit.

General Considerations

Carbides are used extensively, with the standard classifications of single-point tools and standard holders making it possible to reach most surfaces. During multiple cuts, spindle speeds and tool feeds must be set for the limiting tool. However, a combination of carbides on the OD and HSS on the ID often permits higher spindle speeds than otherwise would be possible. Furthermore, as soon as the limiting tool completes its work, faster cutting rates can be established. Sometimes tools can be arranged so this is possible even during the balance of the machining performed at the particular turret station on which the tool is mounted.

While this section includes the operations most commonly performed on automatic turret lathes and the methods by which they are performed, it by no means exhausts the possibilities of the machine. The number of tool stations available and the combination of movements that are possible gives the tool engineer wide latitude in developing tooling to perform unusual operations not ordinarily required on the common run of work.

GOOD TOOLING ELIMINATES SECOND OPERATIONS



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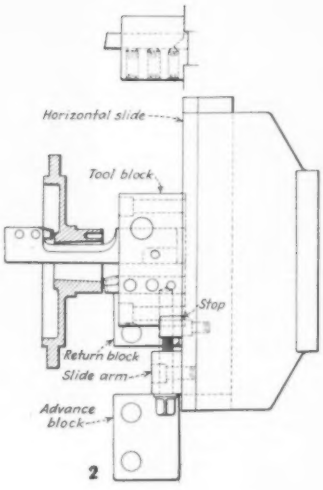

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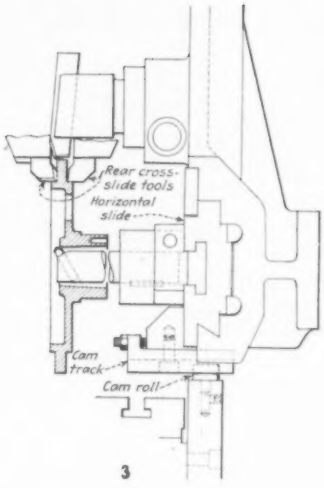

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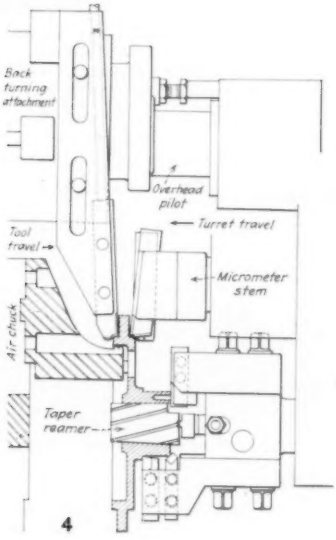

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Cast-iron mounting flange is machined with 23 tools in one setup. Features at each turret station include:

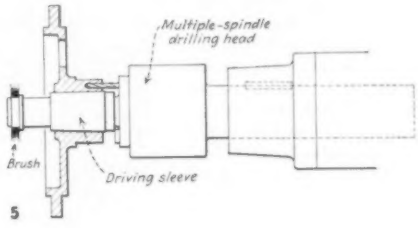
1. Turning, chamfering, and drilling from turret; rough-facing both sides of flange from front cross-slide.

2. Double-facing of hub with horizontal slide tool actuated by blocks fixed on cross-slide. While turret dwells, cross-slide advances. One block engages arm to make cut; second provides positive return.

3. Taper-boring with horizontal slide tool guided by cam track fastened to slide. Track engages cam roll fixed to machine base. Tools in relieving toolblocks on rear cross-slide finish-face both sides of flange.

4. Back-turning rear OD of flange. As turret advances, pusher moves rack and pinion to feed tool toward turret. Six other tools on turret finish-turn, face, chamfer, and taper-ream.

5. Drilling three ¼-holes in hub. Brush cleans chips from bore. Sleeve under spring tension drives head.



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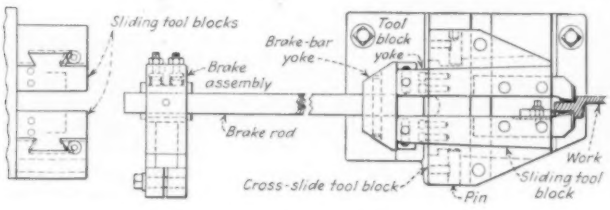
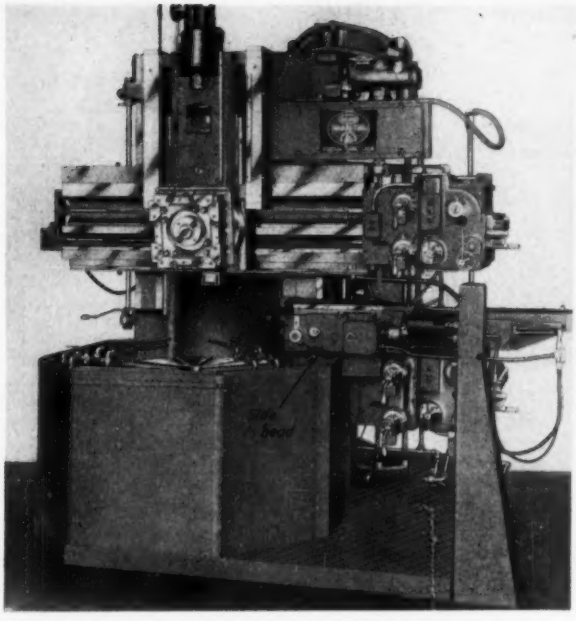
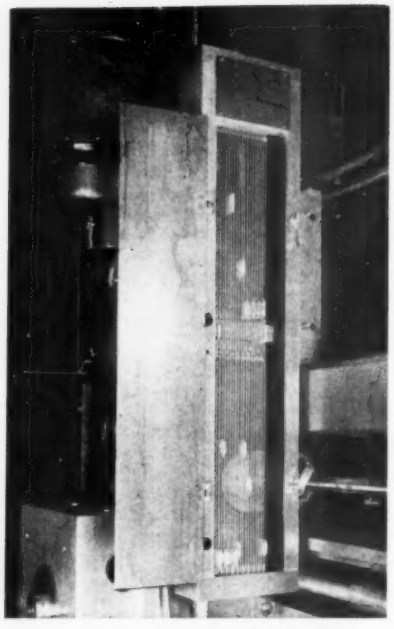


Relieving toolblocks are mounted in dovetail ways cut in rear cross-slide toolblocks at an angle to direction of slide travel. As slide returns, sliding toolblocks are prevented from returning by brake and thus both tools are withdrawn from finish-faced surfaces. Pin in cross-slide blocks then engages sliding blocks to draw them back. On feed stroke brake holds sliding toolblocks and cross-slide blocks advance to close toolblocks for cut



Vertical automatic turret lathe has two 4-face indexing turrets that traverse and feed both horizontally and vertically independently of each other. Main turret is on vertical slide, while small turret is on side head. Machines of this type take work up to 72 in diameter



Stop blocks in detector housing determine point at which machine functions begin and end. As housing moves with turret, blocks trip stationary switches to cause indexing of main control drum

Vertical Automatic Turret Lathes

OPERATION . . . SETUP . . . TOOLING

THE SAME basic operations that can be performed on the horizontal automatic turret lathe also can be done on the vertical machines. For work up to approximately four feet in diameter, the same job often can be run on either machine. Above this figure, work must be done on the vertical. However, because the work rests on the table, the vertical machine is particularly well-suited to irregular-shaped pieces and heavy jobs that are difficult to chuck or to mount on a face plate or fixture. At the same time, the vertical machine can be converted from automatic to manual operation simply by disengaging a single lever. It therefore can be applied to long- or short-run production with equal facility. However, with automatic control most jobs can be performed in 1/3 to 1/6 the time required on a similar, manually-operated machine. This saving in run-time coupled with the fact that the machine is designed for fast setup often make practical the running of lots as small as ten pieces on an automatic cycle.

Operating Features

On this machine, the turret slide moves vertically in a saddle mounted on the cross-rail. The main turret, which is mounted on this slide, has four faces, each of which has three holes for boring bars or other shank toolholders. If only one hole is in use, the remainder of the turret face can mount additional single or multiple toolblocks. Another 4-sided indexing turret is mounted on the side head ram. This turret holds one cutting tool per turret face.

Both the main turret head and the side head have independent feed units. Each head can operate independently of the other but both are interlocked such that no interference can occur. Tools on both heads can feed up or down, and in or out, at any one of sixteen feed rates automatically selected.

The feed units control not only the direction of feed and feed rate, but also direction and point of engagement of rapid traverse, indexing of turret, and selection of spindle speed. Thirty-nine different functions can be controlled automatically in any desired sequence. Therefore, there is no normal cycle or motion sequence through which the tool positions move. The motion path of each tool is arranged to suit the particu-

lar requirements of each individual job. For example, the main head can travel inward at rapid traverse; feed down for a cut at, say, 0.015 ipr for 6 in.; reduce feed to 0.008 ipr and continue downward to a corner; feed outward horizontally ½ in. at 0.015 ipr to face a shoulder; feed down again at 0.025 ipr for 1.5 in.; withdraw the tool from the work and return by the shortest path to the original position at rapid traverse. After indexing, the next turret face then can go through an entirely different sequence. At the same time, the side-head turret can be following a still different sequence.

The length of stroke on any turret face can be varied over the full capacity of the machine and stroke length during one cut has no influence on succeeding strokes.

These features not only provide considerable flexibility in setup but also make possible using one tool for several cuts. This reduces the number of tools required and lowers the time for setup.

During any one cycle, spindle speed can be changed six times. The machine also can be changed to manual operation at any point in its automatic cycle and later can be made to resume automatic operation at any subsequent point in the cycle. This is helpful in the event of tool breakage.

Machines of this type are built in a range of sizes, the smallest being a 30-in. machine and the largest a 74-in. unit. They are equipped either with built-in 3-jaw combination chuck or 4-jaw independent chucks, except for the larger two models. These have a plain table with both parallel and radial T-slots. The 3-jaw chucks can be either manual or hydraulic.

On machines 42 in. or larger, one or two ram heads can be mounted on the cross-rail in place of the turret slide. The ram head swivels, accommodates several tools, and can be employed on those jobs that do not require as many tool positions as the turret supplies. On all machines the side head is optional.

Setup Features

The main head and the side head are each provided with two sets of controls governing the vertical and horizontal movements. These controls consist of a frame in which are mounted a series of steel wires. The entire frame, with its wires, moves with the head. One governs the vertical movement of the main head, and travels up and down with it. Another assembly, mounted horizontally on another part of the main head, governs the lateral movement.

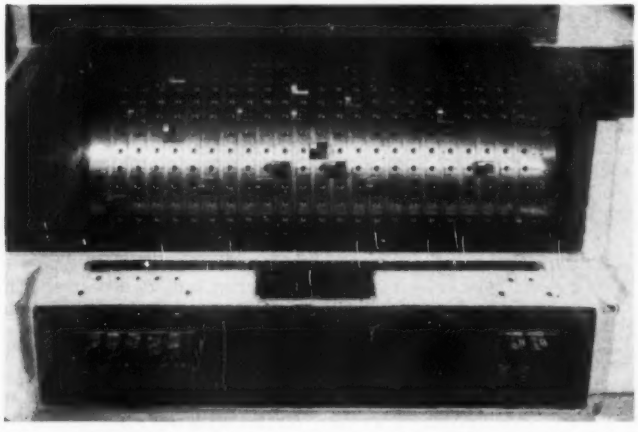
Fastened immovably to the body of the machine is a row of electrical switches, one for each wire. A movable stop-block mounted on each wire may be set and secured at any point on the wire. The position of the stop-block on the wire determines where a given function of the main head is to stop and the next is to begin.

When the stop-block touches the electric switch, it causes a low-voltage current to be sent to another part of the mechanism, stopping the present function and starting the next. This is done through a main control drum. This drum is arranged to receive pick-off trip dogs which represent all the different functions required by the main head for a particular job. The positions of the dogs on the drum determine the functions and their sequence.

On the shaft of the drum is a distributor arm that insures that out of forty possible circuits, only one at a time can be energized. If the arm is in position 6, the drum will index only when the circuit is closed by switch 6.

To illustrate the action of the drum, assume that the head is feeding down, having been started by switch 6. The distributor now is waiting for an impulse caused by the closing of switch 7. Meanwhile, the frame, with its wires and stop-blocks, is feeding down with the main head. Only when stop-block 7 strikes switch 7 does the distributor again release the current required to index the main control drum to the next position, thus stopping the present function and starting the next.

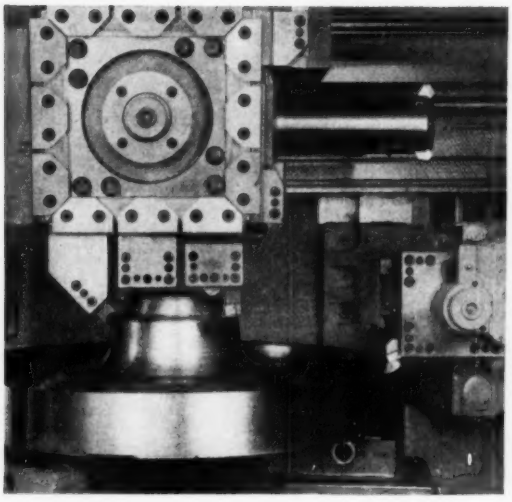
On any job it is only necessary to plan the exact sequence of motion and operating conditions, position the necessary trip dogs in the same sequence on the control drum, and then set the detector stop blocks to index the drum when the changes should be made.



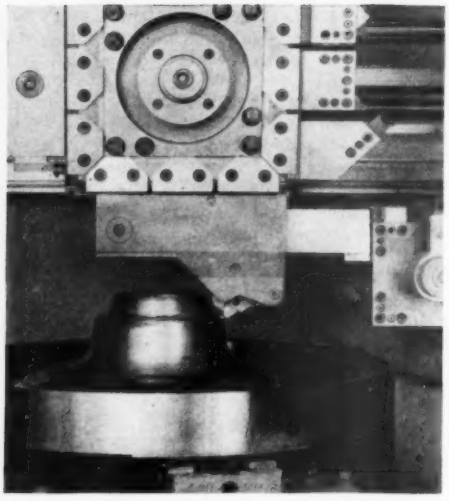
Main control drum has trip dogs that actuate switches controlling each machine function. Drum indexes to bring pre-set dogs in action consecutively

Tooling Practices

Basic tooling objectives on vertical turret lathes are much the same as they are on horizontal machines. As many operations as possible should be performed in one setup and full advantage should be taken of opportunities for multiple and combined cuts. However, as both heads can move in four directions, it often is possible on the vertical machine to take cuts



Toolholders include conventional angle and multiple types on working face, special single-tool blocks and boring bar on second face, and two special radius-turning toolholders on other faces. All clamp directly to turret face



Radius-turning tool is actuated jointly by main and side head. Cam roll on privoted toolarm engages cam track in lever. Movement of lever pivots toolarm to describe radius

on two or more surfaces with the same tool. Cuts may be the same operation, such as turning on two different diameters, or they may be different operations, such as turning and facing. Furthermore, as the machine is flexible, toolholders for the most part simply hold the cutter. Motions for operations such as internal grooving, back facing, and recess boring can be obtained from the machine and movable slide toolholders are not needed.

For example, in machining Diesel locomotive wheels, the underside of the hub is faced during a continuous sequence of motions that also includes boring the ID, turning the hub OD, and facing the upper side of the hub. In this case, the facing and boring tools are mounted in a bar holder and the turning tool is held in a separate block on the same turret face. As the head feeds downward, the turning tool machines the hub OD and one tool in the bar bores the hub. The head then feeds horizontally to the right to straddle-face the upper and lower side of the hub simultaneously. Next, the head feeds down a few thousandths and then to the left to finish-face the upper side of the hub. When all tools are clear, the head then rapid traverses upward.

In job tooling, therefore, it is necessary to plan the movements of the head and the relative position of tools on the head to perform the required operations with greatest over-all economy.

Standard Toolholders

Standard toolholders can be mounted directly on each turret face. Bars for boring, reaming, and threading can be inserted in one of three holes in each face or can be clamped in any position across the face. Toolblocks for single-point tools can be clamped in the same way. Standard toolblocks hold one, two, or three toolbits either perpendicular or at an angle to the end of the work. These can be positioned anywhere across the face of the turret but are not adjustable in the length that they extend from the turret.

If the tooling is to be used on several jobs, toolbits can be clamped in a shank-type turret tool post that fits the bar holes in the turret. In this case, the length that the post projects is adjustable and the same post can be set for multiple cuts on a number of jobs where the surfaces being cut simultaneously are of differing distances from the turret face. However, when the machine is being tooled for high production, customary practice is to make special toolblocks that extend the required distance from the turret and provide rigid support to the toolbit.

Bar Holders

A wide variety of bar-type holders are available for boring tools, reamers, and threading tools. Boring bars have a slot in the head of the bar for engaging a key in the turret face to withstand cutting thrusts. Horizontal or 45° slots are provided for the cutters and bars are made in several diameters with selection depending upon the size of the hole to be bored. Drills are held in a taper socket, which also is slotted at the upper end.

Acknowledgement

We gratefully acknowledge the generous cooperation of the following companies in the preparation of this report:

The Bullard Company

The J. W. Bullard Manufacturing Corporation

Gisholt Machine Company

Potter & Johnston Company

The Warner & Swasey Company

Reamers consist of a body in which two cutting blades are held at 45° angles with the bottom of the body. Clamp nuts secure the blades and screws provide accurate adjustment. A locating slot in the body centralizes the assembly in a bar holder and provides approximately 0.035 in. float during the reaming operation. Holes from 1 to 8 in. in diameter can be reamed with the tools.

Reamer bars are made in a range of sizes and lengths. The bar should be as near the size of the hole as possible to provide good support for the cutting blades. Normally, the tools will ream to 0.0005 in. of dimension or better on the average job.

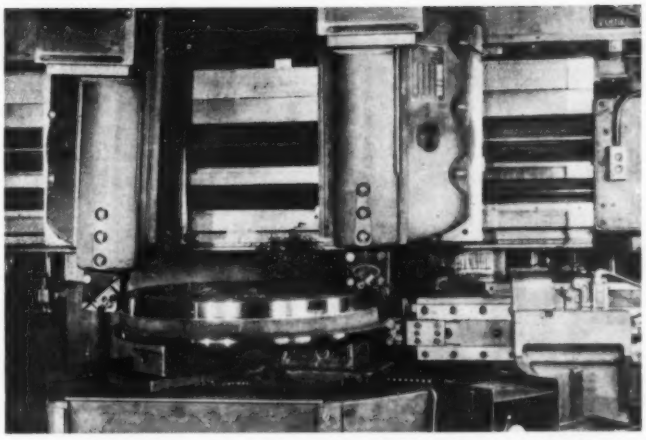
Threading Methods

Threading can be done with single or multiple thread chasers with the main head driven through an attachment that provides the proper gear ratio to move the turret at the correct feed rate for the pitch of the thread. The chaser is clamped rigidly in a bar holder and, at the end of the cut, the head moves sideways to remove the chaser from the thread. The head then feeds upward to remove the bar from the work.

Angular Turning

The same attachment also can be used for drum scoring and for angular turning. For angular cuts, the attachment is set up to provide simultaneous horizontal and vertical motion to the head with gearing providing the proper ratio for any angle greater than 1°47′ on each side of a vertical or horizontal reference. Angles within this range can be cut in all four quadrants of a circle.

Very slight angles for which it is difficult to obtain gear ratios that will give a satisfactory feed motion can be cut with a second attachment that operates with a slide tool. The attachment, which is hydraulically operated and can be actuated from the main control drum, pulls the toolholder parallel to the surface to be machined. An internal cam feeds the tool at the required angle. This same principle can be applied to contour turning.



Contour-turning attachment machines lower half of flange on railroad car wheel with carbide. Head then moves up so second carbide slug can complete contour, blending it with rim. Meanwhile, one ram head taper-turns tread, while second faces and radius-forms top surface, then moves in to face hub

Contour Turning

Contours also can be cut with a standard electronic contouring attachment. Operating from a templet, this attachment simultaneously controls both the vertical and horizontal drives so the head produces the required contour in the work.

Internal and external radii can be cut with the hydraulic attachment previously mentioned. In this case, the tool is held in a swinging arm that contains a cam roll below its pivot point. This engages a cam slot in a sliding member that is pulled by the attachment. As the slide moves, the tool arm swings about its pivot point to describe the required arc. Cam slots must be developed for each shape cut.

Die casting is turned, chamfered, and flat faced at first position, threaded at second, in vertical automatic chucker without turret

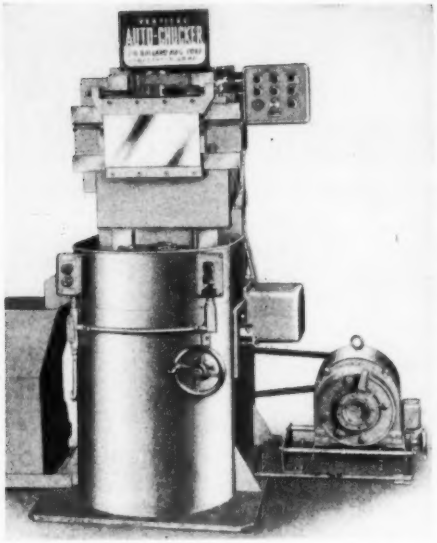
Another method of radius cutting employs a fixed arm on the machine frame. The toolbit is held in a slide attached to the turret slide and is connected to the fixed arm through a lever, that pivots at each end. As the ram descends, the lever swings about a pin in the fixed arm, advancing and withdrawing the slide and causing the toolbit to describe a radius in the work. Both internal and external radii over a wide range can be cut on setups of this kind.

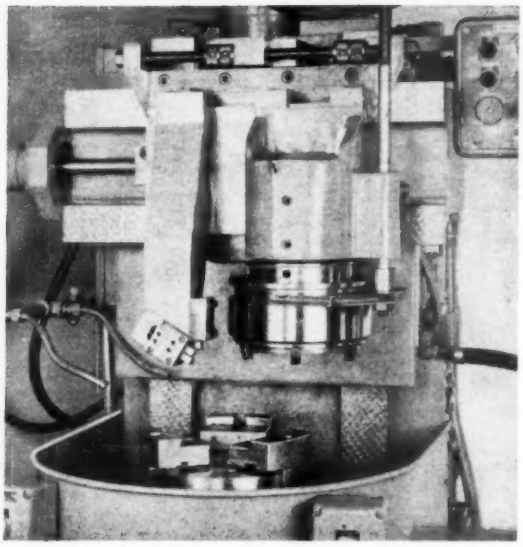
Vertical Chucker—No Turret

Brand new in the vertical automatic field is a machine that mounts tools on a flat platen slide. While the machine has no turret, it does work that often is done on turret-lathe equipment and, for this reason, is included in this report.

The platen slide is moved horizontally between two adjustable stops by a hydraulic cylinder. A second hydraulic cylinder provides vertical movements, both rapid traverse and feed. During the feed stroke, a roller on the platen slide is in contact with a flat cam that controls the travel of the slide and determines the exact rate of feed for the cut.

With tools mounted in special holders on the slide, the machine goes through the following opera-

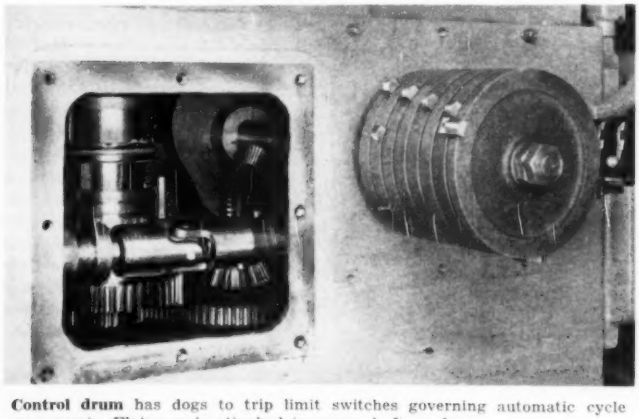




Vertical automatic chucker has toolslide that moves horizontally between two adjustable stops and vertically as required. Hydraulic or pneumatic cylinders move slide with vertical feed rate governed by flat cam. Two sets of tools are mounted as required for job. Closeup at right shows how tools are mounted for machining die-cast piece (page 127)

tion sequence automatically: the slide descends at rapid traverse, feeds, rises rapidly, moves longitudinally to the second stop to position the second set of tools over the work, descends rapidly, feeds, rises rapidly, and returns to the first stop to position tools for the first operation on the next piece. All operations are controlled by settings on a drum mounted on the same shaft as the feed cam. Dogs on this drum throw switches that actuate each motion.

At present two speed changes per cycle are possible but four are planned for a new model. Likewise, four horizontal stop positions will be provided instead of two, thus increasing the number of toolslides that can be mounted on the platen. The feed rate depends upon the shape of the cam and can be varied over the full range of the machine. Toolblocks are special for the job but standard blocks with provision for adjustment are planned.



Control drum has dogs to trip limit switches governing automatic cycle movements. Flat cam is attached to same shaft as drum

Basic Operations

All basic operations can be performed including turning, chamfering, flat facing, boring, drilling, reaming, and threading with collapsible taps and self-opening die heads. Threading tools can be held rigidly without float, as the feed rate for the pitch can be provided by the shape of the cam. Good threads are obtained even on light alloys.

The machine is intended primarily for relatively long runs on work on which stock removal is light. It also provides fast automatic operation on jobs that, although they require several operations, actually do not make efficient use of the broader tooling possibilities of machines with indexing turrets. Die castings, for example, often need a few finishing operations to ready them for production. While the machine is well-suited to this class of work, it also can be applied to much heavier work as it is powered for cuts requiring up to 10 hp.

We Mobilize for Freedom

CONTROLS . . . A Two-Edged Sword

It may seem dangerously premature to talk about getting rid of emergency government controls while all-out war is still an imminent possibility.

But success in this strange struggle for our freedom into which the Russian Communists have plunged us requires that we:

1. Maintain a whole battery of controls designed to speed defense production and curb inflation, and at the same time

2. Work to end the controls at the earliest possible moment.

Here is the reason why this editorial—fourth in a special series on mobilization for defense—is devoted to the need for a speedy release from controls.

If the Russian Communists can force us to maintain indefinitely the present system of government controls, they will have won a tremendous victory. They will have saddled us with a system of collectivism which, over a period of years, would be fairly certain death to freedom of business enterprise.

Make no mistake about it. This is not an argument against emergency controls. We need controls now to break a right of way for our mobilization program through the business boom. Indeed, the third editorial in this special series was titled "Why Controls Are Necessary." It stressed both the need for controls and the need for positive cooperation to make them work.

Controls Can Undermine Our Economy

But these controls surely chisel at the foundation of our normal economic system. So long as we have them, many if not most key business decisions will be made in Washington bureaus rather than in the free market place. For example, the *National Production Authority* administers a *Controlled* Materials Plan (italics ours) which directs the flow of basic metals, and decides who can use them for what purposes.

Happily, the people who operate these controls are not using the methods of a secret police state.

Even more happily, most of the leaders who have been drafted to manage the controls are not in love with their jobs. They are doing their best in the thankless task of making controls work. They recognize the danger of chronic controls.

But the fact remains that our economy is

operating under arrangements which carry it a long way toward the pattern of centralized control the Russians would inflict on the world.

The Wilson Plan

A plan for getting rid of these controls has already been developed. It was put together by our Director of Mobilization, Charles E. Wilson — while he was working day and night to set up the necessary emergency controls.

The Wilson Plan — if we escape all-out war — will strengthen our defenses and our economy. By 1953, it calls for:

1. Providing the weapons to equip an armed force of 3½ to 4 million, together with a supply of weapons for our allies.

2. Building a stockpile of weapons which, with current production, would be sufficient to carry on an all-out war for a year.

3. Building the manufacturing capacity by which we could rapidly expand our production of weapons if all-out war should come.

4. Increasing the productive capacity of industry enough to resume the expansion of our civilian economy.

With these jobs done our economy would be big enough and strong enough to meet both civilian and military requirements. And the government controls needed for mobilization could be speedily dropped.

Call for Sacrifice

The Wilson Plan requires a major effort — it means spending more than $50 billion a year for mobilization. That is almost 20 percent of our total production. And this cannot be done without sacrifice. For a time, particularly in the next year, living standards will drop.

But the sacrifice required is amazingly small. At the peak of the defense effort, civilians will still have available to meet their needs about as much as they did in any year before 1948.

To make the Wilson Plan succeed we must curb inflation. A second year of inflation such as that which we have had since the Korean war started would multiply disastrously the costs of our defense program. One key part of a successful program to curb inflationary pressure, which soon will be building up again, is a pay-as-we-go tax program. The second editorial in this series urged that we do our utmost to pay as we go.

We Cannot Out-Control the Communists

But, above all, to make the Wilson Plan work we must keep our sights set on the crucial importance of increased production. Our problem is to increase our capacity to produce so that we can carry both a major military program and an expanding civilian economy for as many years — General Bradley thinks it might be fifteen or twenty — as the menace of Russian Communist aggression persists.

If we do not produce enough to do this double job, we shall be confronted with the prospect of having to live indefinitely under government controls of the sort that have been set up since the start of the Korean war. That would be delightful to the Russian Communists. It would go far toward making over our economy on the Moscow model.

Even if we wanted to, we never could hope to out-control the Russians. They are miles ahead of us in that line. But we can out-produce them, by a tremendous margin. By doing that we shall travel the surest road to victory.

McGraw-Hill Publishing Company, Inc.

1 **Six special plates,** 3.687x38x38 in., were rolled of 347 ASTM-A240 Grade-C stainless by Allegheny-Ludlum at Coatesville, Pa. Shipped across the country to National Supply at Torrance, Calif., they were heated to 1700 °F and formed in this 1200-ton press to the familiar orange-peel shape

2 **Segments were powder-cut** by the Linde process at Research Welding & Engrg. Co., South Gate, Calif. Templets aided in getting proper bevel. Cut edges were ground to remove foreign matter and segments pickled. Heliarc was used for the root weld; backup strips 3/16x1 in. supporting and aligning the parts

3 **After the first pass,** joints were inspected by X-ray and Dy-Chek, the latter requiring a red penetrant to be painted on. Any excess is removed with solvent, then a white developer draws out the dye. Defects show up against the white background

4 **Joints were filled** by multi-pass arc welding. Heat-treating was done in a car furnace, the vessel being held at 1950 F for 3½ hr, then quenched by internal and external water sprays. Discharge was 150 gpm for 3 min at high pressure

STAINLESS ORANGE PEEL HOLDS NITROGEN

Nitrogen gas expels the propellants and oxidizers from fuel tanks of rocket-propelled planes undergoing test. It will be stored as a liquid in a 54-in. sphere with 3.687-in. walls

ROUND TABLE

Persistent Debtor

"Ed, Williams is having money troubles again. I just had word from the front office that this time I've got to let him go. This is the third time somebody has threatened to garnishee—and the front office says Williams just hasn't got a sense of responsibility."

"Well, Al, that's been a rule here and other places ever since I can remember. A fellow who can't pay his debts and gets his wages garnisheed is a nuisance—and might even give the company a bad name to some extent. Nowadays, the company has to withhold taxes, dues, and all sorts of things, and worries enough about that—let alone for debts too."

"But why not release the debt rather than the debtor? Why doesn't the front office just take over the debt and collect on the instalment plan from Williams? He's a good man—just inclined to be a little free with money."

"That's the point, Al. The company takes over this debt, and before you know it, Williams will be in hot water again, and will expect the company to take over that one too."

"It doesn't have to. In the first place, the company can insist that Williams not contract any more debts until this one is paid off—with his job as forfeit. In the second place, somebody from purchasing or the legal department could check first to see that it's a fair debt. These garnishees are frequently a result of sucker-buying, you know."

"Mebbe so, but we're running a shop, not a kindergarten, and Williams has been in trouble before. Give him the money to pay the debt and he's just silly enough about money that he'll use it to buy something else."

"Well, then, let the company pay the debt. You act like Williams ought to go to debtor's prison or something, like they used to in the old days. It costs a lot of money to train a man—enough that it ought to be a good investment to clear up a man's troubles instead of firing him for them. They could lend—and lose—about a thousand bucks on Williams and still save money."

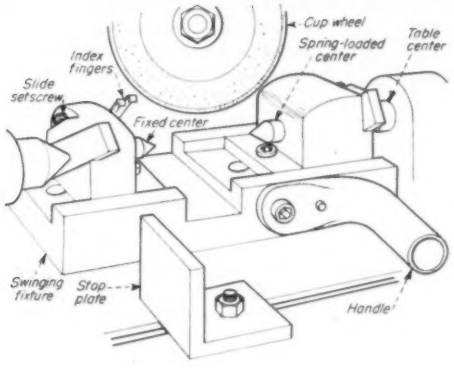
"Not in the long run, Al. If Williams finds things too easy, he's encouraged to go right on as he has. The only way to cure him is to stop him cold and teach him a lesson."

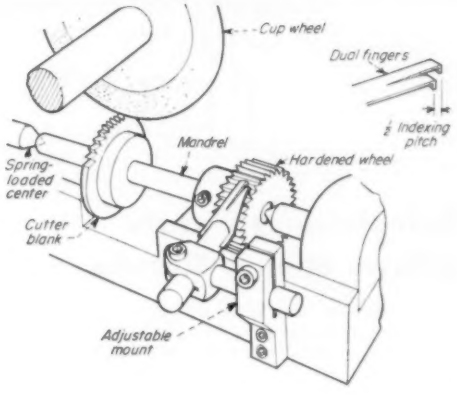
"Still an advocate of the kill-or-cure method, eh, Ed? You sound like a shop foreman of 50 years ago, not like one today. I'm going up front to talk with 'em again and see if they won't help Williams—and me—out."

"You'll be sorry, Al. You won't help either Williams or yourself. You're just postponing the day until you have to train a replacement, that's all."

***IS DISCHARGE** the answer to the persistent debtor? Would financial assistance from a special fund be any better—or just prolong the trouble? What about replacement problems? Your ideas and opinions on this subject will help others. Discussion of earlier topics on later pages.*

Practical Ideas

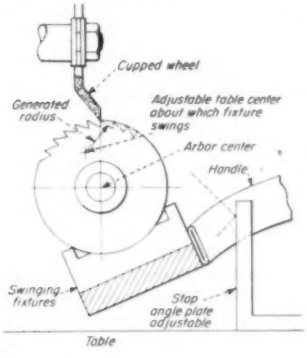




Universal Grinding Fixture Positions Thin Cutters and Saws

THIS SIMPLE FIXTURE is swung between the table centers of a standard horizontal grinder to make it possible to grind or regrind a large number of different types of thin cutters with many different tooth forms, rake angles, and even elliptical faces.

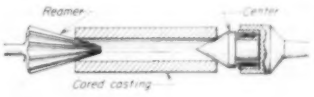
The fixture is really a mandrel carrier, consisting of a base that has two center heads of its own. The heads are adjustable along slots in the base to take any mandrel length; and each head carries a center, one fixed, and one spring-loaded to grip the mandrel securely. Each head also has a slot across its back at an angle of 45° to the horizontal. This slot at each end of the mandrel carrier contains a slide, which, in turn, is supported by the table center of the machine.



It is the location of the mandrel centers in relation to the table centers that controls the swing of the fixture; and therefore controls the angle form, size, and shape to be ground. Both slides are adjustable, and are clamped to the heads by setscrews.

The work is clamped on the mandrel with a hardened index wheel, and the mandrel is mounted between the head centers. The index wheel has a long collar and setscrew, allowing it to be positioned rotationally in relation to the teeth of the cutter. Working from the back of the base is an adjustable indexing-finger support, which carries a two-fingered spring-steel indexing catch. This design allows a cutter with twice as many teeth as the index wheel to be controlled, because the two fingers are spaced so they catch alternately in the teeth of the wheel.

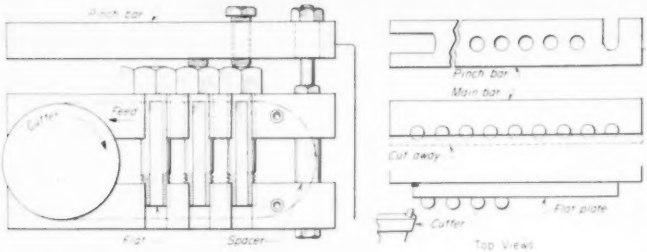
The grinding pass into the wheel is progressive, not plunge. The wheel is a cupped style, and is dressed off so the rim is vertical and flat. As the handle bolted to the front of the base is pulled up and out, the whole assembly swings around the table centers, which act as pivots. Because the head centers are not aligned with the table centers, this motion brings the cutter being ground up to the edge of the wheel, making a grinding pass to form or regrind the cutter. The angle-plate base stop is located so the assembly can only swing enough to bring the cutter to full tooth depth against the wheel. *Chester S. Ricker, Detroit, Mich.*



Pipe Reamer Chucks Cast Tubing

TO FACE OFF and turn the full length on a batch of cored castings, we made a setup with a pipe reamer in the lathe chuck. A ball-bearing center was mounted in the tail.

A broad-nosed carbide tool was employed to cut ⅛ in. deep with a 0.030-ipr feed. One 2-in. reamer was utilized to chuck work with inside diameters ranging from ½ to 2in. We ran more than 150 pieces of various diameters this way, producing less than 0.015 in. runout on the OD in relation to the hole. *Robert A. McCloud, San Lorenzo, Calif.*



Bolt-Holding Fixture Allows Milling Shanks

WHEN SEVERAL THOUSAND BOLTS made from high-tensile, nickel-chrome steel had to be milled flat on their shanks, from the ends almost to the heads, we faced a problem. The bolt steel was tough, which eliminated high cutting speeds and expensive tooling; and the flat was long, which made holding difficult.

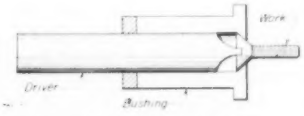
Two bars of $1\frac{1}{2}$-in.-square mild steel were cut to length for the milling table, were drilled and finish-bored to take the workpieces with their heads butted together, and were built into a fixture that mounted on the miller table. The fixture support was angle iron. The bars were spaced apart to span the length of the bolts, and were held to the angle plate by capscrews.

A third bar, called a pinch bar, was mounted to clamp over the heads of the bolts and to hold them by means of setscrews driven into tapped holes. This bar was slotted to clamp under large bolts at each end of the fixture.

Six HSS cutter inserts were added to a shanked cutter body to do the milling. After the fixture was assembled, the cutter was passed over the length of the two main bars, cutting into the bolt-holding holes to a depth that would clear enough stock to allow the flats to be milled.

Bolts were easily loaded into the fixture from above, after the pinch bar was removed. The bolts had to be aligned in the fixture so their flats would match, thus preventing them from rotating.

After the first pass was made, the bolts were rotated (with the pinch bar released), a flat plate was slipped behind them to bear against the flats, and the fixture was reclamped for milling flats on the opposite sides of the work. *Ian J. Peacock, Ainstable, England.*



Rethreading Workholder Grips Flat-Head Screws

TO ALLOW rethreading some flat-head screws — to form the thread extra-close to the head—I devised this holding attachment.

First I cut the handle off a Reed & Prince screwdriver (they were R & P screws) and made a shouldered bushing, as illustrated, to admit it. The inside lip of the hole through the bushing was cut to the exact angle of the screw heads. Finally, the bushing was slotted almost completely through, along its axis, with two cuts; one at 90° to the other.

During production, a screw is dropped into the holder, the screwdriver is dropped in back of it, and the assembly is chucked. The collet grips the holder tightly, thus preventing the screwdriver from coming out the back.

Several thousand screws were rethreaded this way; with a die-head doing the chasing. *C. B. Winch, Tonawanda, N. Y.*

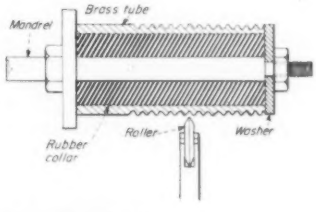
Tinned Feed-Control Nuts Eliminate Backlash

NUTS FITTED to milling-machine tables, lathe cross-slides, and other machine-shop drive mechanisms are usually bronze or brass; and by the nature of their work, they are subject to fairly rapid wear because of poor lubrication and chip action. To reduce this trouble, it is our custom to remove the nut, degrease it thoroughly, then tin the threads with a high-tin-content solder.

Surplus solder is shaken off, and the entire surface of the threads is coated with bearing metal (white-metal). Again, the surplus is shaken off.

The nut is reassembled after it has cooled. Plenty of lubricating oil is applied, and it is often necessary to force the nut onto the screw by working it back and forth. Once this is done, the nut will hug the screw closely, and will not produce backlash.

The condition obtained is that of a bronze-backed thin whitemetal bearing surface that will reduce shock. The surface is renewable any time, time and again, and provides greater accuracy throughout the life of the machine. *Dan Penway, Carlisle, England.*



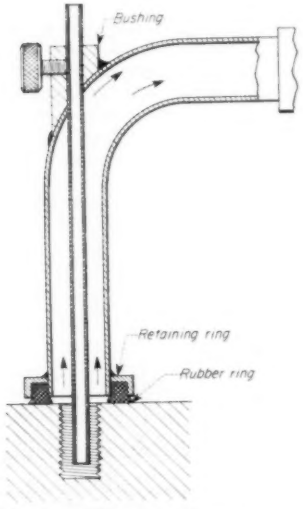
Thread Rolled On Rubber Mandrel

WE HAD TO THREAD a number of brass ferrules. The trouble was, they were hollow tubes, not thick enough to take normal threadcutting. We overcame our difficulties by rolling the thread.

First we found some thick rubber tubing with heavy walls, then made a mandrel to fit inside the rubber. Finally, we pushed the brass stock over the rubber, and

clamped the ends with washers and nuts to squeeze the rubber.

With a rolling wheel in place of the usual threading tool on the toolside, the thread was rolled by feeding the rolling wheel just like a threading toolbit. The wheel had been hardened and ground to form. *R. G. Vare, Christchurch, England.*



Vacuum Cleaner Clears Tapped Holes

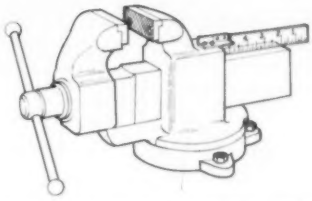
BLIND HOLES, after being tapped, are invariably partly filled with chips. Many shops do not have compressed air handy to permit blowing them out, and even those that do find the practice somewhat dangerous. For such cases, this attachment for an ordinary household vacuum cleaner is ideal.

To set up turbulence in the hole, a bent thin-walled pipe is made to fit the head of the cleaner, and a straight small-dia pipe is inserted through the bend and nested by a welded bushing on the main pipe. The smaller pipe extends beyond the larger one, and is centered inside the other pipe.

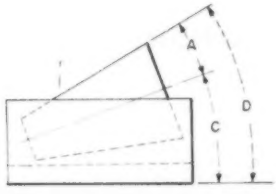
When placed over a hole, the fitting drags chips out immediately. The small pipe goes inside the hole, while the larger one fits on the top surface of the part with the rubber washer sealing it. Air rushes through the small pipe and is dragged into the cleaner, taking chips with it. *Tom Brown, Middlesex, England.*

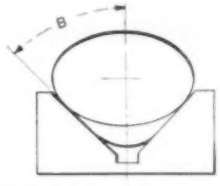
Bench-Vise Rule Tells Jaw Spread

THE JOB of checking measurements and setting vise jaws a specific distance apart was simplified when we installed a thin plastic ruler on the frame of an ordinary workbench vise. The ruler was fastened with a strap and screws on the top of the movable-jaw beam, which also had the advantage of preventing anyone from using the surface as an all-too-handy anvil.



As the movable jaw is moved out, the beam moves, too, and indicates the exact jaw spread on the ruler, which is fixed in position. This made the bending of flat iron bars to definite shapes and the force-fitting of iron bars into brass tubing to various depths easier. *Fred Lettino, Astoria, N. Y.*





Locating Cones in V-Blocks

FOR CHECKING tapered plugs, or when locating tapered parts in jigs and fixtures by means of V-blocks, the angle between the centerline of the tapered part and the base of the block should usually be known. Usually you only know the included angle of the taper and the angle of the V in the block; so here is how to find the other angle:

Divide each of the given angles by two, to give you angles A and B in the sketch. What you want to find is angle C in the sketch, and you get that by:

$$\sin C = \frac{\sin A}{\sin B}$$

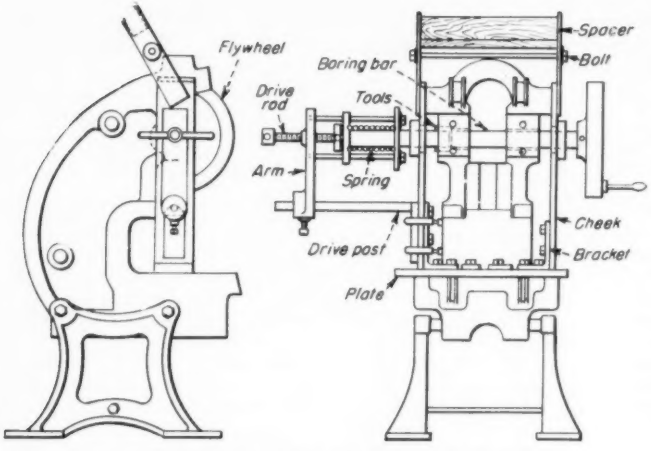
For the usual V-block with a 90° included angle, the formula simplifies to:

$$\sin C = 1.4142 \sin A$$

To check a tapered plug on a sine plate, the surface of the plug, not the centerline, must be horizontal. Therefore, the sine plate must be set to the angle D in the sketch, which is the sum of angles A and C.

The table gives the values of angle A, angle D, and the sine of angle D for the most frequently used tapers. The table assumes the use of a 90° V-block. Calculations must be made for other angles. *E. J. Rychlik, Brookfield, Ill.*

Taper, Series & No.	Taper, in./ft dia	Angle A, deg, min, & sec	Angle D, deg, min, & sec	Sine angle D
B&S				
1				
2	.502	1° 11′ 55″	2° 53′ 38″	.05049
3				
4	.5024	1 11 58	2 53 45	.05052
5	.5016	1 11 53	2 53 28	.05044
6	.50329	1 12 6	2 54 4	.05061
7	.50147	1 11 50	2 53 26	.05043
8	.50100	1 11 46	2 53 16	.05038
9	.50085	1 11 45	2 53 14	.05037
10	.51612	1 13 56	2 57 5	.05349
11	.50100	1 11 46	2 53 16	.05038
12	.49973	1 11 35	2 52 49	.05025
13	.50020	1 11 39	2 52 59	.05030
14				
to	.5010	1 11 38	2 52 57	.05029
18				
Morse				
0	.624	1 29 23	3 35 48	.06273
1	.59858	1 25 44	3 26 59	.06017
2	.57941	1 25 52	3 27 19	.06027
3	.60235	1 26 17	3 28 19	.06056
4	.62326	1 29 17	3 35 34	.06267
5	.63151	1 30 27	3 37 23	.06319
6	.62565	1 29 37	3 36 22	.06290
7	.624	1 29 23	3 35 48	.06273
Jarno				
2				
to	.6000	1 25 57	3 27 31	.06033
20				
	.750	1 47 25	4 19 12	.07533
	3.500	8 17 57	20 4 39	.34329



Press-Reboring Rig Is Hand Fed

IN A LARGE WORKS, where a number of power presses are in operation, one of the presses breaks down every now and then and requires its crankshaft bearings to be rebored. Many of these presses are shopbuilt, and they have crankshafts running in cast-iron frames with no bushings of any kind. The only bearings are the holes through the cast-iron frames.

Brass sleeve bearings are put into worn presses, which means that we must bore out the original bearings. With no boring machine in our shop or in the surrounding area large enough to do the job, some other method had to be devised. We decided to do the work by hand, with the following method:

A flat plate is bolted to the press platen, then brackets and side cheeks are bolted to the plate. The tops of the cheeks are held together by a rough vise made up of two side plates, a wooden spacer, and a long bolt. The cheeks are bored (before being installed) and fitted with bushings that will support and guide the boring bar while it cuts.

To drive the boring bar, a long drive post is clamped to one side cheek, and an arm is clamped to this. The boring-bar drive consists of a threaded-and-pointed rod which turns through a tapped hole in the arm. This rod pushes into a centerdrilled hole in the end of the boring bar, thus forcing the bar along. To prevent the cutter and bar from jumping when they clear through one of the bearings, a pair of long compression rods tie between the arm and a bracket that goes around the boring bar. Two springs exert pressure between this bracket and a heavy collar that is setscrewed to the end of the boring bar.

The far end of the boring bar is fitted with a large flywheel, borrowed from an old machine, and this was provided with a handknob so the boring bar could be rotated by hand. The flywheel evens out the rotation considerably.

After the mechanism is inserted, with the cutter next to the bearing area, the flywheel is rotated while the screw is turned. When one bearing is finished, the rig is reversed and the other bearing is cut.

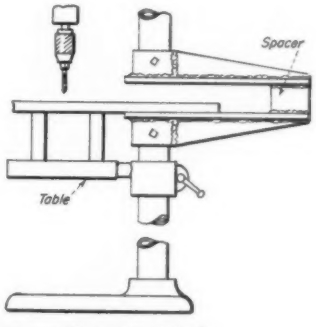
As an occasional job, it saves expense by eliminating the need for sending the press back to the factory. It may be slow, but it is actually economical because of the time saved and because we do the whole job in our own shop. *James Pearman, Hove, England.*

Flexible-Shaft Machine Recuts Shaft Keyway

KEYWAY MILLING can be done for repair jobs, where only one piece must be cut, by rigging a flexible-shaft machine to drive a cutter. The shaft is held between centers on a lathe, with a dog holding it to prevent rotation. The faceplate is locked in place.

A simple ball-bearing head can be made to fit on the cross-slide of the lathe to hold a keyway cutter in a tapered hole. The spindle through the bearing must extend out the back so the flexible shaft can be coupled to it. A heavy-duty floor-model flexible shaft machine set up near the lathe will drive the cutter, while the carriage can be traversed by hand.

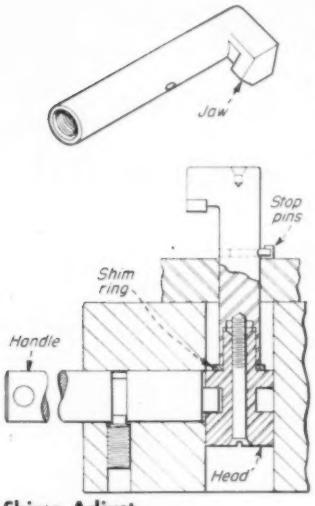
The job is not productive, but is only intended for one-of-a-kind jobs and emergencies. *Nobuo Arakawa, Tokyo, Japan.*



Deep Throat Added To Standard Drillpress

HERE'S a fairly simple attachment to convert the Delta-type drillpress to a deep-throat press. Two pieces of steel tubing with setscrews, a couple of steel plates with welded angle braces, and one spacer for whatever thickness of stock is to be drilled are all that is needed.

It is necessary to cut the column of the drill at any convenient spot, then insert the attachment. Parallels will be necessary to raise the work into line with the throat. *Bernard Levowich, Brookline, Mass.*



Shims Adjust Fixture-Clamp Opening

BY ASSEMBLING through a fixture base so the clamping handle can be located at the front of the fixture, this design allows the operator to keep his hands away from the cutter or punch.

An L-shaped piece of steel acts as the clamp jaw. This has a dog or knurled point on the inside edge of the L to provide positive holding of the work. The other end of the jaw is drilled and tapped to take a threaded and grooved head, while the head is locked into the jaw by a jam screw through a tapped hole.

The handle is made up of a cross rod and a turned and grooved rod with a dog point that matches the groove cut in the clamp head. The dog point is turned slightly off center, so it will clamp when the handle is in one position, and will release when the handle is turned. The groove in the handle is matched by a dog-point retaining screw that prevents endwise motion of the handle.

Two innovations add usefulness to the clamp. Between the clamp jaw and the head there is a shim ring, which may be any thickness to raise the jaw to slip over the work. This ring can be ground down to make the clamp grip a thinner part, or can be replaced by a thicker one. A cross pin in a hole in the shank of the jaw is inserted to work between two vertical pins in the top face of the fixture base. This prevents the jaw from twisting as the handle exerts torque on the jaw when it is turned. *H. M. Philbrick, Hartford, Conn.*

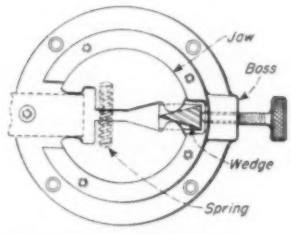
Cast Half-Nut Engages Special Leadscrew

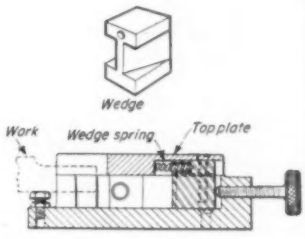
OUR SHOP needed a number of special-pitch worms that were delivered to us lacking about 0.031 in. of full tooth depth. Having no miller or lathe that would recut them accurately, we made a special setup on the lathe.

First, we made a mold for a half-nut like the regular leadscrew nut on the lathe; only we incorporated part of one of the worms in it to make the nut mesh with the workpieces. The nut was cast of white metal.

Then, we coupled one of the worms to the regular lathe leadscrew so we could traverse the carriage of the lathe as the worm rotated with the chuck at a 1-to-1 ratio. An arm from the carriage held the half-nut in engagement with the worm on the leadscrew.

We made a form tool to cut to full depth in the worms, and recut them easily. Our lathe had a reversing motor, so we didn't need to disengage the nut at all—simply stopped the lathe and backed up the carriage for a new cut. *W. V. Henry, Chandler, N. C.*





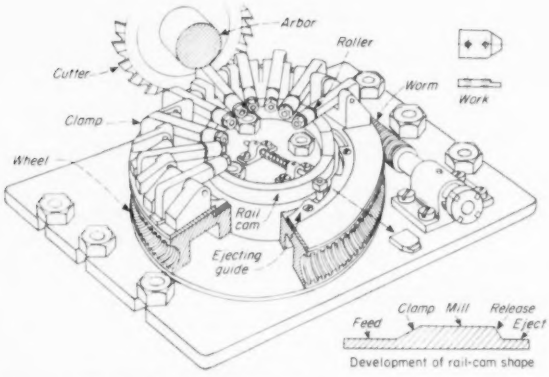
Fixture Clamp Both Grips and Centers

TWO FEATURES make this fixture clamp useful for many applications. Because the clamping jaws are operated by a wedge in the mechanism, they center the workpiece as well as clamp it.

The round fixture body is bored out to take two matching clamp jaws that are identical. These are held apart by a spring that connects two blind holes, one in each jaw. At the back end of the jaws, a taper block operates to lever the opposite ends of the jaws together to grip the work.

A boss at the right side of the baseplate is drilled and tapped to take a handwheel screw which advances the wedge to clamp the work. The wedge is retracted automatically as the handwheel is backed off by pressure from a compression screw that slips in between a blind hole in the top of the wedge and a slot in the top plate. The top plate is also recessed to a channel shape to guide the top edge of the wedge back and forth. Capscrews assemble the top plate to the body of the fixture.

Although rounded jaws are shown, any kind of serrations could be provided, and the clamp can be attached to a number of different jigs and fixtures. It is also possible to make several sets of clamp pieces to fit the same body, providing different openings for different workpieces. *W. M. Halliday, Southport, England.*



Rotary-Feed Mill Fixture

MILLING A STEP on a punch-pressed piece is done on a horizontal miller fitted with a completely mechanical clamping and ejecting dial fixture.

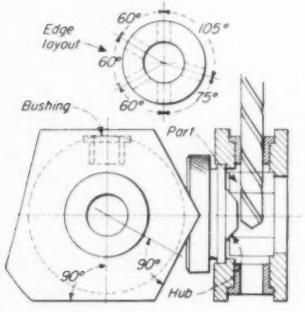
The fixture has a large baseplate, on which is mounted a round thrust pad with bearings under it. On top of the pad a large worm wheel rotates, driven by a worm that is powered by a take-off from the milling arbor.

Around the periphery of the worm wheel are a number of clamping rods, pivoted on pins and brackets built up on the worm, and operated to clamp and release the parts individually by a collar cam mounted inside the circle of the clamps. The brackets themselves are milled to shape to position the parts exactly so the correct amount of stock will be milled off.

Loading is done where the clamps are released. Ejecting is done with a spring-loaded rod in the center of the fixture, which is operated by a cam ring just inside the ring on which the fixtures are built up. *M Yamaguchi, Kawasaki, Japan*

Round Drill Jig Locates Round Part

WE HAD the problem of drilling five holes in each of 4000 steel rings. The holes had to be radial, and aligned accurately in relation to each other. We did the job by making a plate jig with bushings located in the edges of the jig to guide the drill.



The jig was cut from a piece of solid stock that was milled and turned to form a round channel between the two straight-sided flanges. Holes for the bushings were drilled through the channel after the stock was bored out to admit a workpiece. The work rested against a shoulder at the rear flange, and was held in place by a large handwheel screw with a tapered-and-hardened hub that bore against the ID of the work.

No other fixture equipment was needed because the straight sides of the two flanges were cut to align the holes opposite them vertically with the drill. *Robert Laimbock, Innsbruck, Austria.*

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PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards, and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

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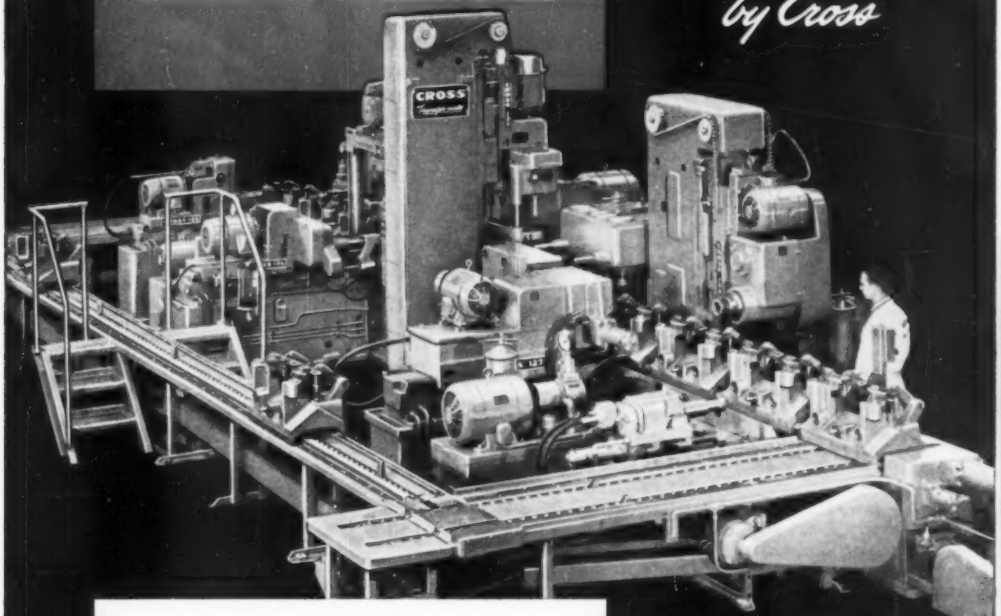

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Counterbalances for Press Rams...I

BY D. A. ROGERS, President,
DAYTON ROGERS MFG. CO.

A counterbalance cylinder, installed on the average punch press, assures smoother action, reduces wear, increases the safety and improves the over-all machine performance. Its function is similar to that of a door check.

The pneumatic type of counterbalance cylinder gives over-all flexibility and control to correct the falling of the press ram due to its own weight and that of the attached tools. The variation in weight of the ram, as different size tools are attached, is compensated for by regulating the pressure applied to the cylinders.

Often excessive pressure is applied to the brake to eliminate falling of the ram. This, of course, is unnecessary when the correct size of counterbalance cylinder is used. This eliminates brake wear, as well as adding materially to the safety of all reciprocating parts of the punch press clutch and ram. This emergency usually occurs as an over-riding of the ram at top of stroke when unusually heavy tools are fastened to the ram section. This is overcome by increasing the air pressure on the counterbalance cylinder, and thus eliminates all backlash of the ram punch press and reduces general backlash of the ram mechanism to a minimum.

A surge tank can be introduced and piped with one or both of the counterbalance cylinders, such as Fig. 1, to eliminate excessive cylinder air pressure at the bottom of the press stroke. The stroke capacity of the cylinders is usually the stroke of the press plus the adjustment of the ram. A combination reducing and regulating valve and pressure gage is applied to the cylinder line to maintain constant pressure on the cylinder, or cylinders, compensating for probable leakage during the cylinder piston work cycle.

Spring counterbalances, Fig. 2, are often standard equipment on certain size presses. Coil spring *A* corrects the over-riding of the ram. However, when the ram adjustment is raised or lowered, it is usually necessary to change the spring tension by adjusting the nuts *B*, so there is no prohibitive spring tension at the bottom of the press stroke. This type of counterbalance is not the most satisfactory for long stroke or deep drawing presses.

Rubber ram checks, Fig. 3, can only be used at the bottom of the press stroke, because there is excessive built-up pressure when the engagement occurs at the beginning of the stroke. Rubber bumpers *A* can be provided in sizes from 3 to 10 in. dia in various lengths. Piston section *C* is screwed on the ram connection and locked in place, and can be adjusted so that the dimension *B*

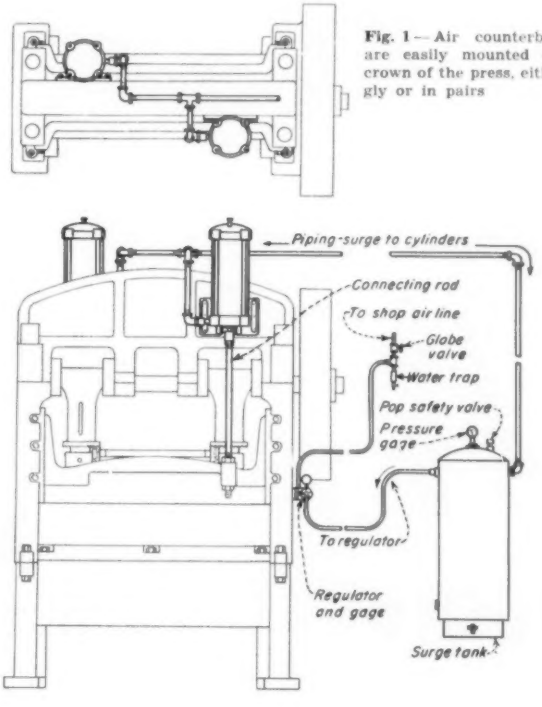

Fig. 1—Air counterbalances are easily mounted on the crown of the press, either singly or in pairs

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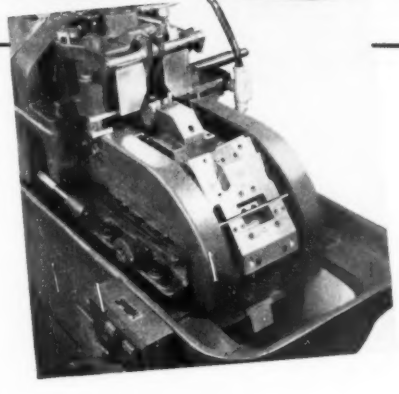

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Counterbalances for Press Rams...II

can be the stroke of the press, allowing for tension necessary at the bottom of the stroke.

These rubber snubbers and rubber ram checks can be used only for limited applications; but have been used satisfactorily in checking the ram for severe blanking operations.

Backlash of the ram can be eliminated in all blanking operations on extremely heavy or high tensile material at the point of operation by the correct type of ram counterbalance so adjusted to check the inertia at this period of the down cycle of the ram.

All connections of such counterbalancing should be fastened directly to the ram itself. These "checks" can be readily installed on all punch presses and power brakes. Although many of the straight side and inclinable presses do not have provisions for attaching the lower end of the connecting rod to the ram, there are many forms of simple welded brackets that can be made up for this purpose.

In the event pneumatic counterbalance cylinders are selected, the following matters should be considered:

1. Approximate weight of the ram.
2. Stroke of the press.
3. Adjustment of the ram.

The size of the cylinder should be chosen to compensate for these three conditions. The pneumatic counterbalance should have a holding capacity equal to twice the weight of the ram, and a stroke equal to the stroke of the press plus the adjustment of the ram. Using a cylinder with a holding capacity equal to twice the weight of the ram allows for a safety factor of approximately 50%, inasmuch as the tools seldom weigh as much as the ram. For example, should the press have a stroke of 7 in., the adjustment of the ram 3 in., the approximate cylinder stroke should be 11 in. Should the weight of the ram be 1800 lb, the counterbalance cylinder should have a holding capacity of 3600 lb, or about 1.8 tons. In other words, the counterbalance cylinder should have a piston diameter of 5 in., and a maximum stroke of 11 in., provided with a surge tank, combination regulator and gage, to maintain constant recorded holding pressure for checking the ram during its work cycle.

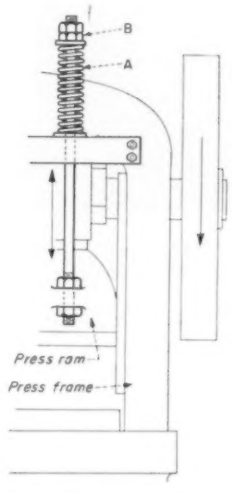

Fig. 2 — Spring counterbalances correct over-riding of the ram but must be reset when the ram adjustment is changed

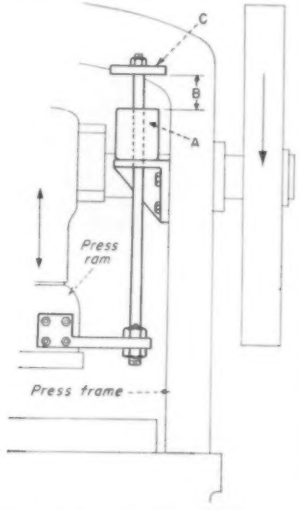

Fig. 3 — Rubber ram checks are satisfactory for severe blanking operations but are limited in use with other press operations

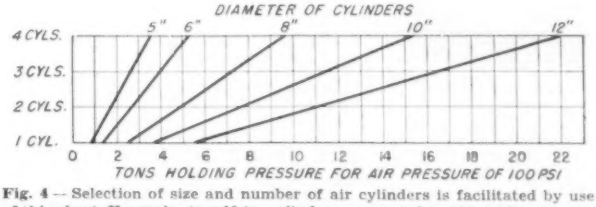

Fig. 4 — Selection of size and number of air cylinders is facilitated by use of this chart. Example: two 10-in. cylinders connected to 100 psi line have a holding pressure of 7.7 tons. Since holding pressure must equal twice the ram weight, a ram weight of 3.85 tons can be accommodated

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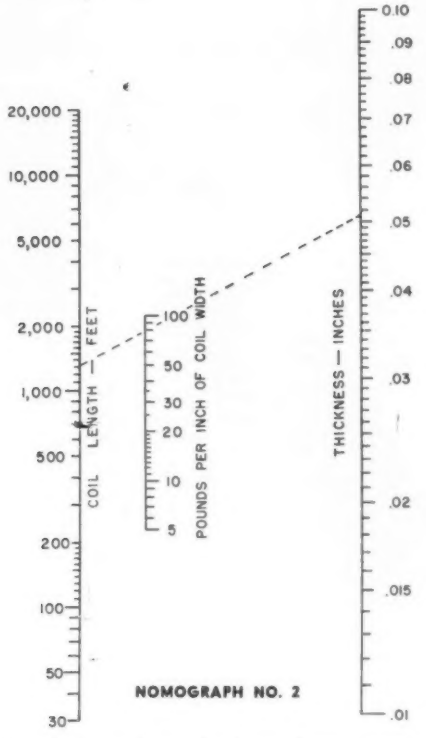
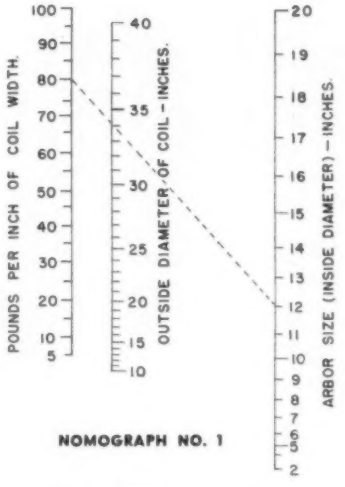
Aluminum-Coil Weight and Length

JOSEPH T. HOGAN



NOMOGRAPH NO. 2



NOMOGRAPH NO. 1

Mill products, such as aluminum, brass, copper magnesium, monel, etc., are frequently furnished in the form of coils slit to a range of convenient widths. Computations associated with coiled stock are greatly facilitated by use of the attached nomographs, which supplement one another.

The nomographs are primarily constructed for computations of aluminum strip, based on the density of commercially pure aluminum, which is 0.0979 lb per cu in. For material of different density, multiply the weight scale by an applicable conversion factor.

Nomograph No. 1 can be used two ways. If a coil is to be wound on a known size of arbor size to a specified weight-per-inch-of-coil-width, the coil OD can be found. If arbor size and OD are known, the weight per inch of coil width can be found also.

Similarly, Nomograph No. 2 can be used two ways. Having the lb per in. of coil width from Nomograph No. 1, and the thickness of the sheet, the length of the coil can be found. Or, knowing the coil length and the thickness, the approximate lb per in. of coil width can be obtained.

Example 1: What is the weight of an aluminum coil having a 34 in. OD and 12 in. ID?

Solution: A straightedge connecting 34 and 12 on the appropriate scales of Nomograph No. 1 intersects the weight scale at 80 lb per in. of coil width. Multiplying 80 by the width of coil gives the total weight.

Example 2: If the above stock has a thickness of 0.051 in. what is the length of sheet in the coil?

Solution: A straightedge connecting 0.051 and 80 (which was found in Example 1), on the appropriate scale of Nomograph No. 2 intersects the coil-length scale at 1300 ft.

Example 3: What is the weight of a coil of magnesium sheet having a 34-in. OD and 12-in. ID?

Solution: A straightedge connecting 34 and 12 on the appropriate scales of Nomograph No. 1 intersects the weight scale at the value 80 lb. per in. of coil width. Since the density of magnesium is 0.063 lb. per cu in., multiplying 80 by 0.063/0.0979 yields the value of 51.5 lb. per in. of coil width.

The nomographs were constructed from data obtained from the "Aluminum Data Book," Reynolds Metals Co.

Here's the Grade-A File for Grade-A Work!

RED TANG

is the mark of the file that is *like no other file* . . . the file that is made to highest quality standards...and designed by Simonds Cutting Tool Engineers with the same easy cutting tooth as Simonds famous metal-cutting saws. Yes, this is the file that *cuts*, instead of scrapes . . . that takes off more metal with less elbow-grease...*the file that workers like.* Order *now* from your Industrial Supply Distributor.

SIMONDS
SAW AND STEEL CO.

FITCHBURG, MASS.

Branch Offices in Boston, Chicago, San Francisco and Portland, Ore. Canadian Factory in Montreal, Que.

TALKING SHOP

My Tools

NEW MACHINE OPERATORS at one Eastern plant are given a modest "tool allowance", with which they are expected to equip themselves with necessary hand tools. Thereafter, they must maintain their own. The company provides only special tools, thus avoids pilferage and wastage. Further, the reports are that shop tools are locked up each shift end, not left around.

Paper Preparedness

WHEN PACKARD took over the manufacture of the Rolls-Royce *Merlin* engine in the summer of 1940, it first had to spend 10 months redrawing 2000 blueprints American fashion and translating the Whitworth thread forms into American Standard on 3200 nuts, bolts, and studs.

Pallet, Pallet

A LARGE automotive producer checked recently, discovered it had an inventory of $2,500,000 in pallets, most of them in the wrong places. A detailed control system didn't help much in getting pallets where they were needed first among a number of branch plants and almost four-score suppliers. Now, collapsible pallets are replacing the wooden pallets, and saving considerable money because of the recent ICC ruling that pallets can be returned at half the fourth-class rate.

Draft Drill

THE OPERATOR of a multiple drill at one medium-sized metalworking plant was drafted recently — the draft board blandly overruling all protest. A frantic search of the adjacent countryside turned up no potential successor—so the production line was revamped to skip the complex machine. Just as things began to settle down again, the former operator phoned from across the nation —he'd been rejected after three weeks in the Army and needed money to get home on. Now the line has been changed back—until the next hopper-filling draft call.

For Labor

SHOP EXECUTIVE, so the story goes, recently got himself tangled up in his plant problems so he couldn't sleep nights. This doctor refused to prescribe anything but rest and relaxation. Two days later, the exec was back, asking for sleeping pills; still no sleep. Again the doctor refused, said they were habit forming. A day later, the exec was back again, half crazy, to insist he couldn't take time off, had to get a sleeping potion.

"How about twilight sleep?"

"That's only for labor," explained the doctor.

"What, nothing for management?"

Versatile Test

ONE OF EACH familiar make of power hacksaw and bandsaw is installed at one end of the new sawblade plant of L. S. Starrett & Co., Athol, Mass., so a continued testing program can be carried on. Any material or any piece can thus be sawed on equipment like that of the customer, and proper blade recommendations made.

Mike Notes

ONCE "MIKE" FORGINGS are drilled and reamed at L. S. Starrett & Co., Athol, Mass., all subsequent machining operations are located from plug centers in these holes. Thus alignment of anvil and spindle are assured . . . Various hard facing materials have been tested and are used on anvil and spindle, but exhaustive tests indicate they offer little in the long run over the glass-hard tips of the original material . . . Latest addition to finishing equipment there is an infra-red oven for drying finishes on tools.

Magnet Checker

DINGS MAGNETIC SEPARATOR CO., Milwaukee, needed an easy-to-use tool for measuring magnet strength. The answer turned out to be a GE gauss meter, according to Karl A. Blend, chief engineer. The instrument gives a true reading regardless of position or distance from magnet poles, permits control of magnetic force to very close tolerances.

Ash Tray, Sir?

TO PREVENT scoring of expensive aluminum assemblies, one company has gone over to linoleum-topped benches, kept scrupulously clean. Another uses aluminum table tops—even on drillpresses where minor assembly holes are drilled. The linoleum-covered tables began to show cigarette burns at the edges, and cigarette butts also messed up the floor. So that company cast aluminum ashtrays with tilt tops. Held on a swinging arm clamped below the bench, they don't get in the way, but end both problems.

When Dust?

A MAKER of precision instruments had just about decided that complete air conditioning was necessary in final assembly. But tests proved that dust did its settling *between* assembly steps rather than during them. So assemblies are now set into cabinets over the benches between jobs. To remove any discovered dusts, assemblers use an "air" hose that evacuates under ring-valve-adjustable vacuum, rather than blowing the dust off—and into the air.

Mechanized Labor

MATERIALS HANDLING this year entered the billion-dollar class—a tenfold increase in eleven years. To us, that indicates two things: First, machines are at last being allowed to do more of what machines ought to do. Second, labor is pricing itself out of the market.

News of Metalworking

McGraw-Hill WORLD NEWS

• **DIESEL TESTS BEGUN**—A prototype, multi-engined, diesel locomotive is undergoing tests by British Railways. The 2000-hp diesel is the most powerful yet built for British Railways and utilizes a mechanical transmission through a gear box instead of the usual electric type. It was designed for both passenger and freight mainline service.

• **AUTOMOTIVE ORDERS** — A total of 98,000 orders for trucks and motorcars were placed with German and foreign manufacturers at the eleven-day International Motor Fair held recently at Frankfurt, Germany. More than 600,000 persons from all parts of the world attended the exhibit.

• **RENAULT IN SPAIN**—Renault "baby" cars may be built at Valladolid, Spain, by a new firm, SAFASA. Two-thirds of the components would be produced in Spain, the remainder being imported from the Renault factory at Billancourt, France.

• **ROLLING STOCK POOLED**—The international freight car pool agreed to less than three months ago by the railways of France and Germany has begun to function. The pool, now using 100,000 cars, was designed to reduce empty rolling stock and standardize European railroads.

• **MEXICAN STEEL EXPANSION**—A $5 million expansion program, made possible by a loan from the Export-Import Bank of U. S., will get under way shortly at the Altos Hornos steel mill at Monclova, Coahuila, Mexico. Finishing capacity of the mill will be increased by 70,000 tons yearly to meet long-range requirements of Mexico's expanding economy.

• **FIAT IN BRAZIL**—The Fiat auto works of Turin, Italy, will establish a subsidiary plant in the Sao Paulo, Brazil area. In the early stages, autos, trucks and tractors would be assembled. Final goal is production of a 100% Brazilian unit built to Fiat designs.

Mobilizers Cut Up Alloys Pie, Not Much Left for Civilian Use

WASHINGTON—Mobilizers have ordered a 40% increase in the amount of U. S. molybdenum exported for the use of foreign steel makers—out of a diet of alloys which already is the most critical of the steel shortages. The purpose is to supply an alloy to replace tungsten formerly exported from China.

The order is taking effect this month in double measure. It's an effort to make up for a slacking off in exports earlier this year, and came when NPA had just finished cutting up the alloys pie for U. S. users. The percent of nickel for non-defense use—20%—tags it as the scarcest of the alloys. But the 35% of molybdenum for civilian use isn't as generous as it sounds. It will be on a smaller base as a result of the export order. Complaints coming into the alloys section of NPA the past few days indicate moly may be on the way to equal rank with nickel at the top of the shortage totem pole.

• **Here's the way the alloys** stack up on NPA's melt sheet schedules for June:

Nickel—20% of the supply for non-defense use. The 80% for military and defense-supporting doesn't equal everything they asked for. The military got enough for three-fourths of its orders, as relayed to NPA by producers of alloys. Defense supporting industries got half of what they asked. All others got what was left—15% of orders.

Cobalt—25% of the supply for non-defense work.

Molybdenum—35% of the reduced supply for non-defense.

Columbium—none for non-defense. Military and AEC are the big takers.

Of all the alloy metals, only silicon and manganese — the scavengers — are in plentiful supply. They are used for removing impurities from steel. It's the alloys which impart special qualities to steel that are causing the pinch in supplies.

When Richard Stokes, Great Britain's No. 1 raw materials shopper, returned to London recently from a trip to the U. S., he said he had spent most of his time talking about molybdenum.

The U. S. export allocation of 1,250,000 lb for the second quarter was announced soon afterward. Exports were 890,000 lb first quarter.

• **This is considerably more** than we exported before Korea, but not as much as was exported per quarter in 1950—a big year. By the end of 1952, a scheduled 25% increase in production will ease the situation, both domestic and foreign. It's the way the quota is falling this month, plus the fact that U. S. users had gotten adjusted to a larger-than-usual share, that causes the headaches.

No export figures for April and May have been announced, but in March they had fallen to 163,000 lb. If this rate continued into the first two months of the current quarter, the trade doubts whether shipments can be upped enough in June to fill the quota. Nevertheless, U. S. users were told that their allocations for June were reduced because we have to double up on exports. This indicates an effort to ship up to 900,000 lb abroad—which would establish a new record.

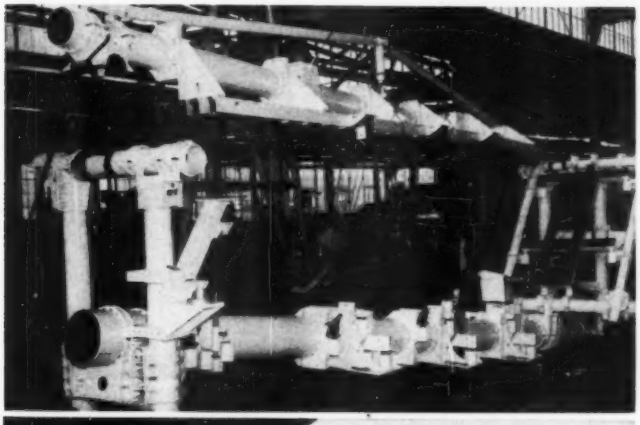
Molybdenum is needed for steel which will withstand the heat of jet engines, gas turbines and turbosuperchargers. It's this demand, coupled with the cutting off of tungsten from China, which has cast moly in its new role as a key material in international trade.

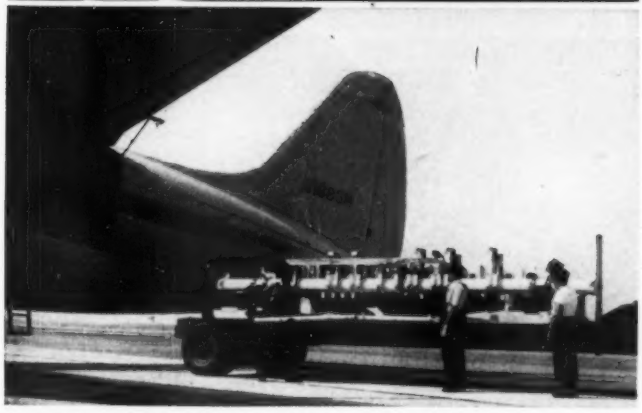
Locomotive Output Pushed

WASHINGTON—The National Production Authority has announced a program for construction of 250 railroad locomotives in the third quarter and extended priority assistance to manufacturers to assure their receiving adequate materials and components.

The program involves 79,000 tons of carbon steel, 14,000 tons of alloy steel, 12,250,000 lb of copper, and 2,400,000 lb of aluminum.

Percentage allotments of these materials for July are: American Locomotive Co., 23.5%; Baldwin-Lima-Hamilton Locomotive Co., 12.9%; Fairbanks, Morse Co., 4.2%; and Electromotive Div. of General Motors, 59.4%.





Top member of the F-86 outer wing panel fixture (upper photo)—knocked down for shipment, is hoisted for crating. The fixture's accuracy is "set in" by use of Republic optical positioner. Lower photo—Disassembled into two major components, the Lockheed fuselage side panel is ready to be loaded for air transport to the West Coast. There it will be reassembled, and checked for accuracy

Optics-Castings Permits Fast Shipment

FARMINGDALE, L. I., N. Y.—Planeloads of tools used to build fighter planes were flown westward last week in an experiment designed to minimize loss of production in event of bomb or other war damage to aircraft factories.

The tools—jigs on which components of the Lockheed F-94 and North American F-86 jet fighters can be constructed—were built by Republic Aviation Corp. here with the new optics-castings method developed by Republic for the Air Force. (*AM* — Dec. 25 '50, p94)

After construction, the jigs were disassembled and loaded on cargo planes headed for the North American and Lockheed factories at Los Angeles. There they will be quickly reassembled and checked by the optical method.

Thus, by air shipment of tools made by the optics-castings method, production lost to war damage could be renewed rapidly. Welded fixtures now in use must be transported by much slower surface means because they cannot be disassembled to fit into cargo planes.

- **The North American fixture**—for an F-86 outer wing panel—was planed out Wednesday, June 13. It knocks down into just five pieces. Reassembly on the coast began Monday, June 18.

While the optics-castings system has additional advantages over the welded tool-making process, the Air Force seeks to prove in the current Phase Two portion of the experimental program that production of a bombed-out factory could be carried on almost without interruption by air shipment of new tools fabricated by the optics-castings method.

- **Spare tools could be built** and stockpiled to meet emergencies, or constructed in a comparatively short time by the new method, feasibility of which was proved by Republic in Phase One of the program—concluded several months ago.

At that time it was demonstrated that aircraft jigs and fixtures could be built three times as accurately by the new method at a substantial saving in time and money, to tolerances as close as 0.001 in. in displacement and 6 seconds in angularity.

Another great mobilization advantage of the optics-castings system is the interchangeability of components it makes possible, even without the use of master tools, due to the greater accuracy built into the fixtures.

More Subcontractor Clinics

WASHINGTON—The Armed Forces are continuing the program of bringing prime contractor needs, to small businesses by means of subcontractor clinics. Early showings include Ft. Worth, June 25-30; Minneapolis-St. Paul, June 25-27; St. Louis, July 9-14; and Cleveland, the week of July 23 or 30. Dates are also being scheduled for Detroit, Los Angeles, Atlanta, and Pittsburgh.

Small Firms Get Aircraft Work

WASHINGTON—The nation's aircraft industry is now using 60,851 subcontractors and suppliers in meeting $26-billion in orders, both here and from allies abroad, according to Aircraft Industries Association of America, Inc. Small business firms, employing less than 500 persons, constitute 87% of these subcontractors and receive about 30% of every dollar taken in by the prime aircraft manufacturers.

Plant Expansion News

• **Norton Co.,** Worcester, Mass. will spend $6 million in an expansion program to increase its capacity to produce grinding and lapping machines. An office building and a 275,000-sq-ft factory will be constructed on a 6½-acre site.

• **Westinghouse Electric Corp.,** Pittsburgh, will construct a 400,000-sq-ft plant at Baltimore's Friendship Airport for the newly created Air-Arm Division of the company. Production will include complete airborne armament systems.

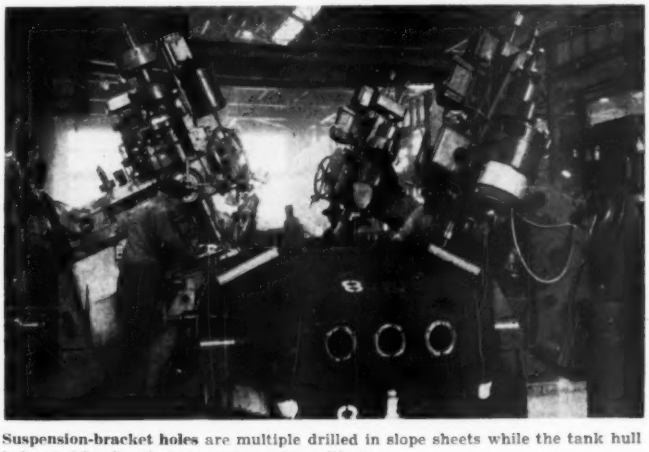
• **Link-Belt Co.,** Chicago, will build a 300,000-sq-ft manufacturing plant at Colmar, Pa. The new plant will produce elevating, conveying, and processing machinery in efficient straight-line manufacture.

• **General Electric Co.,** Schenectady, N. Y., will lease 50,000 sq ft of manufacturing space at Ludlow, Vt. The facilities will be used for parts production for the Aircraft Gas Turbine Divisions.

• **General Motors Corp.,** New York, will construct a 500,000-sq-ft plant at Rochester, N. Y. The one-story building will primarily produce small motors for the Air Force and will be a part of the Delco Appliance Div.

• **Cummins Engine Co.,** Columbus, Ohio, has started a $6-million expansion program for the next two years which is expected to increase present production by 50%. The expenditures are earmarked for office and manufacturing space, machine tools, and research development.

Tank hulls, too large to be turned on the boring mill tables, are inverted and the cutting tools are rotated instead



Suspension-bracket holes are multiple drilled in slope sheets while the tank hull is located by dowels in an automatic positioner

All-Welded Assembly Speeds Output of Tank Hulls

PHILADELPHIA — Baldwin-Lima Hamilton Corp., with more than $60 million in defense contracts for the M-47 General Patton Tank production program, is rapidly expanding facilities for hull fabrication at its Eddystone plant.

Initial production was started last August in 110,000 sq ft of area, formerly the company's steam locomotive boiler shop. This area is soon to be tripled into five 80-ft wide bays, each 875-ft long, capable of keeping 150 tank hulls in continuous manufacture.

Completed hulls weigh about 15 tons and include 800 lb of weld metal. Principal welds join 20 heavy steel plate members and 8 steel castings to form a hull approximately 20 ft long.

• **Handling is minimized** by direct flow of material and by flexibility of motor-operated welding positioners.

All welding is done by the electric-arc method, using transformer type welders of 500-amp capacity.

Pre-assembly machining includes planing of the plate edges and hole drilling in the side plates. After welding is completed, the transmission openings and idler shaft sockets are bored and faced. The bottom slope sheets are then milled for attachment of wheel suspension brackets. Boring and facing of the turret foundation ring is accomplished by inverting the hull on a vertical boring mill and rotating the cutting tools which are mounted on the table.

Final machining operations include drilling suspension bracket holes by multiple head machine, drilling the turret ring foundation, and drilling and tapping the idler sprocket bearings.

Gear Makers Meet, Work on Standards

HOT SPRINGS, Va.—In its first annual session under the new organization plan, the American Gear Manufacturers Association held a number of committee meetings.

The Speed Reducer & Gear Motor Div. is working on standards on overhung loads, on gear-motor design, a broader list of application factors for high-speed gear units, a designation chart for parallel-shaft helical and herringbone units and a set of thermal ratings for these units. Deflection of pinions under heavy loads is to be studied, and the present standard on high-speed units is being revised to cover harder materials. An oilfield pumping gear-reducer rating standard is in rough draft.

Standards 213.01 and 214.01 on surface durability and 440.01 and 444.01 on worm-gear speed reducers are being clarified. Standard 420.01 on helical and herringbone speed reducers is to be reprinted.

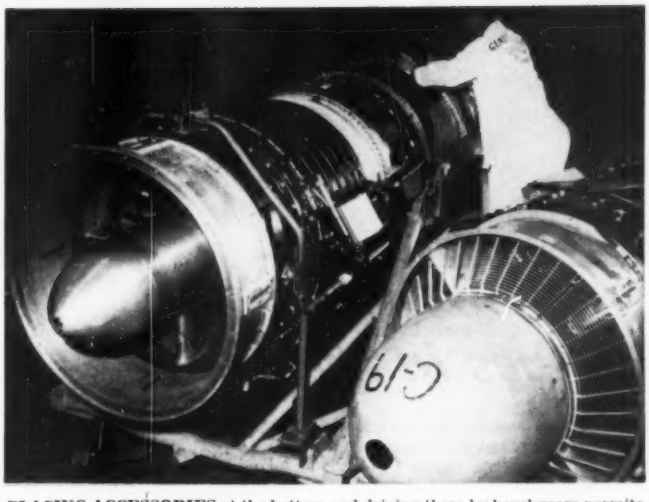
• **The General Gearing Div.** is developing a standard for aircraft power gears for continuous drives and offering its standard on 20° straight bevel gears as an American Standard. Tentative standards on spiral bevel gears and herringbone mill gears are offered as standards. Drafts on fine-pitch face gears, and on standard gear-blank proportions are being worked on. PVT and beam-strength progress reports are being distributed for discussion. The rating formula for spur, helical and herringbone gears is being revised.

The Development Div. has beam-strength and surface durability formulas for straight helical and bevel gears under development. Standard 122.01 on fine-pitch single-thread hobs is being revised, while 121.01 on single-thread hobs is in draft form. A worm-gear hob standard is under discussion. The tentative standard on tooth forms for involute spur gears is being revised. A data sheet for SAE oils for gear lubrication is under discussion, as is one on mild EP and Yukon oils.

"Gear Tolerances and Inspection" is being revised to include ½ dp and diameters up to 200 in., and 235.01 on master gears has been reapproved as an American Standard. Tables for pin measurement of involute spur gears have been recommended as an American Standard.

• **The Industrial Problems Div.** held an open forum of government regulations, a discussion on Regulation 30 being led by Henry Fowler, general counsel, U. S. Chamber of Commerce, and one on problems under CMP by Clarence Burrell.

Carlos Fallon, former chief of staff, Colombian Navy and a U. S. Air Force officer in World War II, discussed Latin America at the 35th annual dinner.



PLACING ACCESSORIES at the bottom and driving them by bevel gears permits a smaller hub on the compressor end of the J47-21 (left), GE's highest-thrust turbojet to date. Larger air passages and a novel compressor are the result of the change, permitting much increased power and better fuel ratio in the same dia (36¾ in.) as preceding engine of the series (right). The new turbine has an integral oil tank and fuel-cooled oiling system. Later types will include the 29, with a different accessory arrangement; the 31, with an afterburner; and water/alcohol injection units. Development time was 18 months

Funds Approved for Jet Development

WASHINGTON — Last week the House passed the 1952 appropriations for the National Advisory Committee for Aeronautics, cutting only about one percent of the funds asked for. The $13.2 million will be spent in enlarging NACA facilities, particularly for experimental testing.

Probably the biggest reason why NACA funds came through practically unscathed was due to the report by Air Force Chief of Staff Vandenberg that U.S. jets are considerably inferior to Russian aircraft.

American jet engines now in operational use deliver about 5000 lb of thrust, and with the addition of a burst from an afterburner, can go as high as 5750 lbs. The Air Force figures that the Russian-built MIG-15 will deliver between 5500 and 6000 lb under normal operation.

New U. S. jet engines, still in the drawing board stage and kept under wraps by NACA and the military, are expected to deliver up to 20,000 lb. But they're still a long way off. Brightest point in the jet engine race at present is the Pratt & Whitney J-48 that has a dry rating of 6250-lb thrust. With the addition of an afterburner, the emergency rating should exceed 8000 lb.

Here's a run-down on U. S. jet engines soon in mass production:

Pratt & Whitney J-57. Considered in some circles as the best jet engine yet. Will power the Boeing XB-52 eight-jet bomber and the eight-jet version of the B-36.

Allison J-35-A-23. A new version of the General Motors J-35. The newer model is said to rival the J-57.

General Electric J-47 and the J-53. Many improvements on older models.

Westinghouse J-40. Very slim engine said to have tremendous power. As yet hasn't been flown.

Curtiss-Wright. Is producing, under license, the British Sapphire and the much more powerful Olympus. Both engines are highly rated.

E. P. Bullard

E. P. Bullard III

Ralph W. Burk

Leo F. Hunderup

Names in the News

E. P. Bullard has resigned as chairman of The Bullard Co., Bridgeport, Conn., and has been named chairman of the board emeritus. He has served the company continuously since 1892, during which time he developed the Bullard vertical turret lathe, the Mult-Au-Matic and the Contin-U-Matic machines. In 1923 he was awarded the Franklin Gold Medal for leadership in machine design, in 1937 the ASME Gold Medal, and in 1944 the Metal Trades Industrial Pioneer Award. He was founder of the Trade School which subsequently was named the Bullard-Havens Technical School in his honor. He is the son of the founder of The Bullard Co.

E. P. Bullard III has resigned from The Bullard Co. For the past 10 years he had been vice president in charge of manufacturing. On May 18 he was elected vice president in charge of engineering and development, but felt that he could not accept that position. He had been associated with Bullard for 17 years and had been responsible for the engineering and design of many new developments, including the Cut Master vertical turret lathe, the Man-Au-Trol vertical turret lathe, the Man-Au-Trol spacer, the 34-in. four-spindle Mult-Au-Matic, and the Type K Mult-Au-Matic.

C. B. Gracey has been elected vice president, operations, Boeing Aircraft Co., Seattle, Wash.

G. A. Nelson has been appointed works manager, Wyandotte, Mich., plant of Pennsylvania Salt Mfg. Co. He was formerly superintendent.

Ralph W. Burk, vice president of sales, Kearney & Trecker Corp., Milwaukee, has been made vice president for manufacturing. He will continue to be in charge of sales. He has been with Kearney & Trecker since 1927, serving as Detroit branch manager, assistant division sales manager prior to his election in 1943 to the sales vice presidency. **Andrew K. Wilson** was named director of industrial relations and head of the personnel dept. He was made a member of the management committee.

John L. Roth was recently named commercial sales manager, York Corp., York, Pa. Mr. Roth will have most of the Midwest territory, with offices in Chicago.

Norman W. Calkins has been named manager, tool steel sales, and **Harold A. Brossman,** manager of alloy steel sales, for Carpenter Steel Co., Reading, Pa.

C. S. Immig has been appointed director of purchases, Hydraulic Press Mfg. Co., Mt. Gilead, Ohio. Mr. Immig was formerly associated with Fairbanks, Morse & Co., and Dominion Electric Corp.

Charles A. Marshall has been elected president and treasurer, Newell-Marshall-Wood, Inc., New York.

Roger F. Dunn has been elected secretary-treasurer of Graver Tank & Mfg. Co., Inc., Chicago. Mr. Dunn succeeds **B. B. McCandliss,** named senior vice president.

Leo F. Hunderup has been appointed vice president and assistant general manager, Greenfield Tap & Die Corp., Greenfield, Mass. Mr. Hunderup was formerly executive vice president of the Van Norman Co. subsidiary of Morse Twist Drill & Machine Co., and is also a past president of the National Standard Parts Association.

Maurice Schulzinger has been elected vice president in charge of engineering, Steelcraft Mfg. Co., Rossmoyne, Ohio. **Nat Lehman,** sales manager of the Steel Building Products Div. was named vice president in charge of sales. **Wm. Skillman,** comptroller, was elected assistant treasurer.

Paul S. Kempf has been appointed manager of industrial relations of Inland Steel Products Co., Chicago, Ill. Mr. Kempf has been with the company since 1947.

J. J. Rozner has been elected vice president in charge of operations of Aetna Ball and Roller Bearing Co., Chicago. Mr. Rozner has been with the firm since 1928 and has been chief engineer since 1940. **J. E. Dillon** suceeds Mr. Rozner as chief engineer.

C. S. Thayer has been promoted to manager of Aluminum Co. of America operations in the Pacific Northwest. In this capacity he will manage the new smelting plant to be built at Wenatchee, Wash. Mr. Thayer was formerly manager of Alcoa's Smelting & Fabricating Operations at Vancouver, Wash.

Russell C. Flood was appointed assistant secretary, A. Schrader Sons Div., Scovill Mfg. Co., Brooklyn, N. Y. Mr. Flood joined A. Schrader Sons in 1930.

E. L. Casey

Herman A. Bottenhorn

C. F. Myers

L. W. Mercer

E. L. Casey has been named vice president in charge of manufacturing, E. W. Bliss Co., Canton, Ohio. Mr. Casey was previously associated with Westinghouse and the Atomic Energy Commission.

George T. Morse, Jr., was elected president and general manager of Peden Iron & Steel Co., Houston, Texas. Mr. Morse started as a clerk with the company in 1928, and was named sales manager in 1940.

Jay E. Browder was appointed chief, radio communications engineering section, Kollsman Instrument Corp., Elmhurst, N. Y. Mr. Browder was 11 years on the engineering staff of Sperry Gyroscope Corp., and was previously associated with TWA.

Albert G. Lauzon was named president, Buckeye Tools Corp., Dayton, Ohio. **Hal O. Gummere** was named vice president and general manager.

Joseph W. Eskridge and **R. J. Waldron** were elected vice presidents of Hudson Motor Car Co., Detroit. Mr. Eskridge will be in charge of manufacturing, and Mr. Waldron in charge of industrial relations.

John E. Rovensky was elected chairman of the board, American Car & Foundry Co., New York, succeeding **Charles J. Hardy, Sr.,** resigned. Mr. Rovensky became a director in 1940 and chairman of the executive committee in 1944. **Charles J. Hardy, Jr.,** was elected chairman of the executive committee of ACF, combining that office with his present position as president of the firm.

Edward N. Case has been appointed product supervisor for metal trades, Industrial Chemical Div., American Cyanamid Co. He was formerly a group leader of the Metal Trades Laboratory, Stamford, Conn.

Herman A. Bottenhorn has been appointed chief engineer, Loewy Rolling Mill Div., Hydropress, Inc., New York. He has been a collaborator of Erwin Loewy, president of Loewy-Hydropress for more than 30 years.

C. F. Myers has been elected vice president and sales manager, Morse Twist Drill & Machine Co., New Bedford, Mass. **A. L. Carr** continues as vice president and director of sales.

H. C. Landsiedel has been appointed general manager, Electric Shaver Div., Remington Rand Inc., Bridgeport, Conn. He formerly was chief accountant of the firm's wartime Sangamon ordnance plant.

L. W. Mercer has been elected executive vice president, Square D Co., Detroit. Mr. Mercer was formerly vice president and general manager of the Switch & Panel Div. **F. H. Roby** has been elected a director and vice president in charge of sales. Mr. Roby joined Square D in 1933. **L. G. Maechtlen** has been elected vice president and director. He has been with the company more than 20 years as a design engineer.

R. Ruzicka has been appointed manager of installation and service, R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. He has been associated with the firm for the past ten years, and will continue as assistant sales manager.

OBITUARIES

Franklin W. Olin, 91, founder of the Olin enterprises which now make up Olin Industries, Inc., East Alton, Ill., died May 21. He founded Western Cartridge Co. in 1898, and Western Brass Mills in 1916. In 1932 Mr. Olin's Western Cartridge Co. purchased Winchester Repeating Arms Co. He retired as president of Western Cartridge Co. when Olin Industries, Inc., was formed in 1944.

Arthur Silvester, 69, of Niantic, Conn., died March 13. Mr. Silvester was a frequent contributor to the AMERICAN MACHINIST feature, Round Table Discussions.

Robert Woods Martindale, retired Pacific coast manager, U. S. Pipe & Steel Co., San Francisco, died May 1.

John McGhie, who joined the advertising sales staff of AMERICAN MACHINIST in 1899 and served 27 years until he retired in 1926, died June 8 at the age of 83.

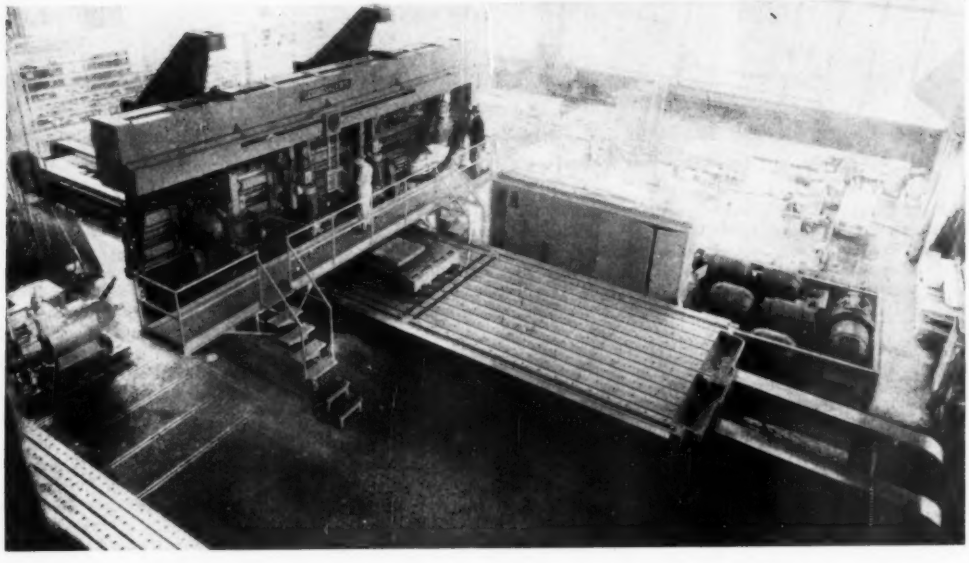
William T. Hunter, 71, retired president of A. Schrader's Son, Inc., Brooklyn, N. Y., died April 1. He was a former vice president of Scovill Mfg. Co. and at the time of his death was a director of the company. He had been associated with Schrader's for more than 50 years until his retirement in 1949.

William M. Powell, 58, president of Diamond Mfg. Co., Wyoming, Pa., died May 14. He was also president of National Association of Perforated Metal Manufacturers.

T. M. Heermans, assistant manager of sales, Allis-Chalmers centrifugal pump department, died May 17. He joined the firm in 1910, was named to his sales position in 1940. Mr. Heermans was an active member of the Hydraulic Institute and was president of the organization in 1949.

Constant A. Benoit Sr., founder and president of Permatex Co., Inc., Brooklyn, N. Y., died May 17.

New Shop Equipment



Aircraft Skins Sculptured by Huge G&L Miller

Dimensions	30 ft wide, 18 ft high, 80 ft long
Table work area	10 ft wide, 34 ft long
Max. table capacity	50 tons
Max. cutting speed	10,000 fpm
Max. metal removal	600 cu in. per min
Under-cutter clearance	48 in.

A 200-ton machine, known as the Hypro aircraft skin mill (Type 100), is the first machine tool specifically designed for the manufacture of self-reinforced "skin" for near-sonic jet aircraft. The miller automatically cuts, edges, and shapes a desired pattern in three dimensions on the surface of a metal sheet. Chips are removed automatically and all bedways are covered.

Machine details were designed by Giddings & Lewis Co., in collaboration with engineers of General Electric and Lockheed, to basic specifications set down by the aircraft corporation.

Virtually pushbutton controlled, the tool will mill integral-rib skin panels from solid or rough-forged aluminum-alloy plate. Unit manufacturing of airplane surfaces and stiffening elements will permit use of thinner wings and sharper fuselages, a prime requisite in breaking the sonic barriers. Decreased structural weight by the use of integrally braced skin, rather than struts and braces, will greatly increase the wing-load factor. More weight is then left for increased firepower, fuel capacity, and instrumentation.

Utilizing GE motor and controls throughout, the machine operates in three dimensions with two feed motions and a range of infinite intermediate speeds between $\frac{3}{4}$ and 150 ipm.

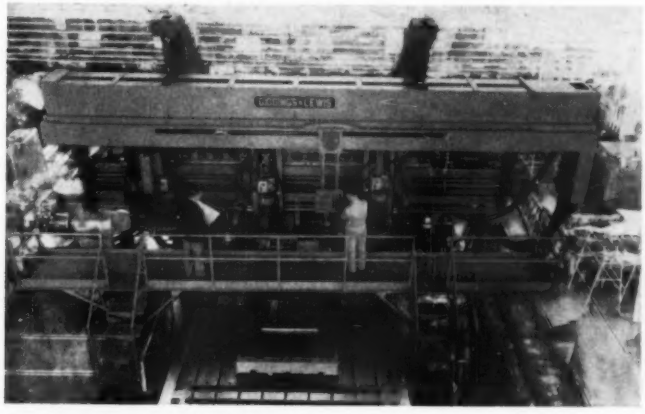
Longitudinal and lateral cutting motions are guided simultaneously from a master pattern by a GE electronic tracer control. This permits constant feed regardless of work outline and permits pre-selection of speeds or easy speed change by potentiometer. To meet variations in web thickness, vertical rise-and-fall cutting action is provided by a vertical milling head.

The operator may control each feed drive individually, may "steer" the cutter by turning a pointer in any desired direction in the table plane and setting the speed-control dial—after which the drives will run at proper coordinated speeds, or by full-automatic tracer control. In the latter case, if the tracer loses contact with the templet, feed motors are stopped automatically. Further, whenever the tracer stylus is brought into contact manually, the automatic control takes over to protect the equipment.

An Onsrud water-cooled unit, powered by a 100-hp induction motor, is used on each of the three milling heads. The center and right head can be used at the same time and have individual profiling systems. The left milling head is universal-swiveling with automatic 360° profiling from templet. A rolling control station can be positioned at the work or at the side, as desired. All spindle bearings and head gears are mist-lubricated.

The machine uses 12 drive motors totaling 350 hp, exclusive of 18 motors and generators delivering the power supply, which totals 1400 hp. A 20-hp motor drives the table. Control interlocks assure safe operation

Materials and Parts



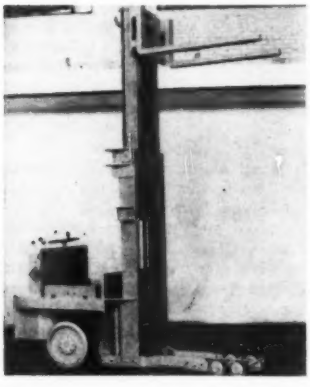
Catwalk over the table enables the operator to watch any head. Rolling control station takes place of pendant, with lines fed in by reel. Other controls are at right side of rail

and prevent work damage. For example, the oil pump must be running before the machine can be started, table clamp and motion cannot be actuated at the same time, nor can rail clamp and rail motion. All ac lines are individually fused, all motors have thermal overload protection, and all drives have undervoltage protection.

Sequence speed control facilitates operation of both feed motions. Table and cutting-head movement can be operated at any selected speed. By combining speed control and steering control, operational ease is attained. Trailing hoses and electrical lines are avoided by G & L feed reels. A catwalk or bridge across the rail makes it easy for the operator to cross from side to side.

The unusual machine tool will soon be put into use at Lockheed's new fabricating plant at Burbank, Calif. Initially it will be used in the production of F-94 jet fighters and is expected to reduce assembly and handling costs materially because the number of parts and attachments is greatly reduced.

Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.



Greater Load for Truck Weight

A fork truck requires counterbalancing, while a platform truck doesn't because of its forward wheels and axles, hence its load capacity is proportionately higher. In a fork truck, load capacity may be only 30 to 50% of total weight. On a platform truck the ratio may be as high as 5 to 80%. This industrial truck combines some of the advantages of both types. The weight of one model is 2 tons less than a fork truck of equal capacity.

The load-supporting member is attached to the elevating mechanism as in platform trucks. In place of a platform, however, two reinforced

... INCLUDING

Plain grinders redesigned for ac motors. Wheels can be reused on smaller machines ..... page 154

Chemical bath removes forging scale during quenching, thus avoiding shotblasting ... page 155

Crushing operation for steel turnings salvage the chips and reusable oil ..... page 156

Balancing machine made in Germany measures by electro-mechanical means ..... page 156

Automatic miller machines both leading and trailing edges of jet compressor blades ..... page 158

Power reciprocating table minimizes distortion danger in belt grinding parts ..... page 160

Instrument ball-bearings made smaller than pinhead withstand shock and vibration ... page 170

Hardness tester gives Knoop or Vickers readings and has range up to 10,000 grams ..... page 168

Flute miller is hydraulically operated and automatically indexed ..... page 168

... and in July 9

Induction heater is designed so that only the control and accessories necessary for the particular application need be purchased.

Press brakes have clutch and brake operating simultaneously, giving better operator control.

alloy-steel forks extend the usual length of a platform. The forward wheels are only 6½ in. dia and the forks in lowered position come outside and nearly flush with the top of the wheels.

This arrangement provides for low underclearance in various skids, as compared with the usual 12 in. required for standard platform trucks. A high-tiering fork can be supplied which has tines that come below the top level of the wheels. The base tier rests on wood or steel skids only 8 in. high, enabling the forward wheels to clear them. Upper tiers are handled on pallets, runners, or cleats in the usual manner of fork trucks.

The trucks are built in several sizes with load capacities ranging from 4000 to 10,000 lb.

Elwell-Parker Electric Co., Cleveland, Ohio

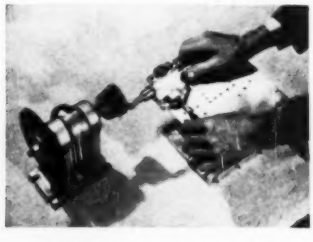
Headstock Powered by AC Motor On Cincinnati Plain Grinders

The headstock on Filmatic 10- and 14-in. plain hydraulic grinding machines has been completely redesigned. It is powered by a 1-hp ac motor with built-in magnetic brake. Power is transmitted through V-belts; an eccentric primary countershaft provides for belt change and tension adjustment. Pulley has four steps for speeds of 50, 75, 113, and 170 rpm. Wheel speed is 830 rpm.

The bed is 2 in. lower than before —39½ in. from floor to centers. Grinding-wheel collets take 12-in.-hole wheels. This size enables smaller machines to use the wheels after they are worn beyond reuse on the larger grinders.

Filmatic bearings for the grinding-wheel spindle have been retained. They consist of heavy shoes or segments which can rock slightly. They are submerged in filtered oil. Rotation of the spindle, plus the viscosity of the lubricant, causes the oil to form high-pressure wedge-shaped films between each segment and the spindle. The wedges maintain dead-center rotation of the spindle for all grinding conditions.

Cincinnati Grinders Inc., Cincinnati 9, Ohio



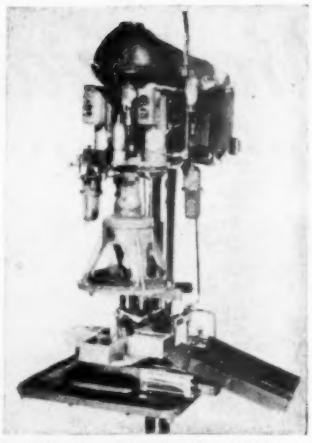
Treyco Tool-Grinding Attachment

Attachment is used for sharpening end mills, countersinks, spot facers, reamers, and similar tools. Adjustable feed, with 6- and 8-point internal indexes, provides control of tools during the operation.

The attachment can be made self-contained by clamping on a graduated swivel vise which, in turn, fits into a fixture on a grinding-wheel stand. Included with the attachment are 3/16-, 1/4-, 3/8-, and 1/2-in. sleeves or adapters for interchanging various tool-shank diameters.

Price for the attachment (Model 500) is $29.95, for the fixture (Model 135) $29.95, and for the vise (Model 550) $11.25.

Treyco Products, 264 Hartford Ave., Kenmore 23, N. Y.



Spindle Head and Index Table Air-controlled on Driller

Tapping and drilling machines which are equipped with automatic, air-controlled multiple spindle heads and index tables are said to provide low-cost flexible operation.

Tapping can be performed without leadscrews or clutches. Light air pressure permits the taps to provide their own lead, thus preventing galling. Class 2 and class 3 fits are claimed to be obtained in materials such as magnesium and soft plastic. Tapping depth is accurately controlled. By reversing the motor, taps lead out without stripping the last thread, even in extruded holes in extra soft metals. The motor can complete a cycle every 3 sec. By switching out the motor-reversing control, drilling operations can be performed.

Speed of both the forward and return spindle stroke is infinitely variable. Any air pressure can be obtained up to 1250 lb using a 100-lb air line. A hydraulic break-through cushion controls break-through in drilling uneven surfaces.

Various types of index tables or shuffleboard work feeders can be supplied to suit the job. Index table is electrically interlocked with the spindle stroke. Work cannot index until spindle is in full-up position and spindle cannot descend until table has indexed to position.

Other features of the automatic air control include automatic lubrication of taps and drills by an atomized oil film applied by an air blast. Chips are simultaneously blown clear. Light work can be air-ejected from the fixture, requiring the operator only to load the work.

Beckett-Harcum Co., Wilmington, Ohio

Steel forgings treated with SR-4 come from the water quench free from tenacious scale (right). The piece on left shows how the iron oxides form. Center piece has gone through conventional heat-treating and quench. Scale will have to be removed by shot blasting

Scale blasts from treated surface of forging the moment it is dipped in cold water. It must be removed before machining

Chemical Bath Blasts Scale From Forgings

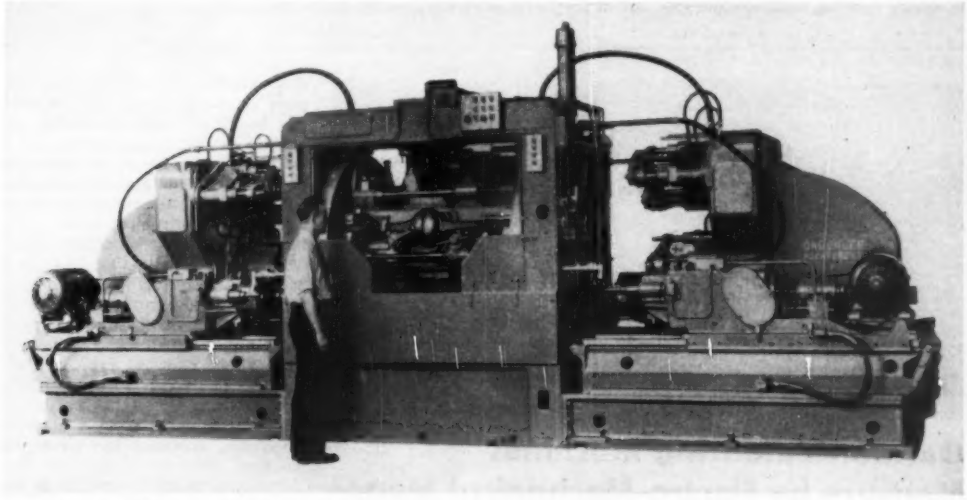
Forging scale is an iron oxide which is harder than steel, is very abrasive, and clings tenaciously to the work. If it is not removed, it interferes with machine-tool settings and quickly wears down cutting tools. If left on finished parts, pieces of the scale may drop into mechanisms, such as transmissions, and rapidly wear the working parts. A bath made up of a chemical, Pennsalt SR-4, dissolved in weak muriatic acid and water, removes this scale during quenching. Savings are said to be 90% over previous methods of scale removal.

Pennsalt and the Spicer Mfg. Div. of the Dana Corp. cooperated in the development and in laboratory and plant tests.

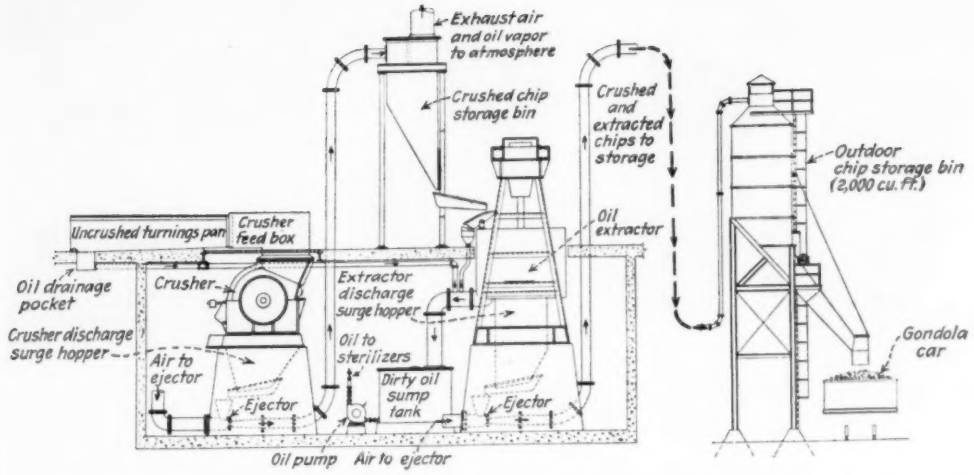
The bath requires no heating and is made up in ordinary rubber-lined tanks. Dipping baskets can be made of simple sheet iron. Parts are immersed in the bath for five min after forging and before heat-treatment. In the subsequent water quench, the scale explodes from the surface.

Satisfactory results have been obtained in descaling plain carbon-steel grades and some SAE alloy steels. The bath has proved efficient in most instances where oil quenches are used, and in cases where scale removal is not complete, sand- or shot-blasting can be reduced considerably.

Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia 7, Pa.



AUTOMATIC INDEXING MACHINE completes 30 operations on automobile rear-axle housings at an hourly rate of 123 pieces. There are six stations at which 30 boring, reaming, and tapping operations are carried out. The machine has four ways, and is equipped with two rear heads to drill and tap breather holes in the sides of the housings. Two dials are combination-bored in each housing end. — *Greenlee Bros. & Co., Rockford, Ill.*



Chips Crushed for Conveying, Oil Extraction

A practically labor-free system that will continuously process crushed, oily steel turnings at a rate of 6 to 8 tons per hour. It utilizes the salvage value of the turnings and at the same time drains off cutting oil that can be sterilized for reuse.

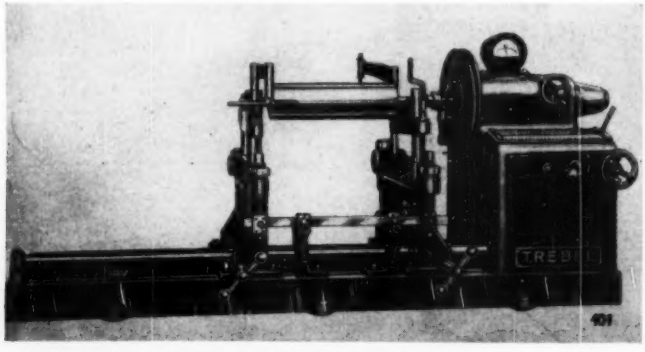
The equipment consists of a chip crusher, pneumatic conveying system, automatic chip extractor, storage bin, and their related accessories.

After the loose oil is drained off, the turnings are fed through a crusher, where rotating hammers and stationary grates break them into chips of fingernail size. To produce a uniform rate of flow in the fixed-velocity pneumatic system, the chips are passed into a surge hopper. An ejector avoids blowback from the 3- to 5-psig air line. It consists of a blower, nozzle, and venturi tube with the surge hopper feeding into the venturi throat. Air from the blower is speeded up in the nozzle then drops to slight vacuum in the venturi—allowing the crushed chips at atmospheric pressure to drop in and be blown into the air line.

The crushed chips then flow to another surge bin. The further separation of oil by means of centrifugal force is completed in a 48-in. DeLaval-AT&M extractor. The clean and uniform chips are then passed into a storage bin for car loading.

The only manual labor involved consists of sorting out the initial turnings to remove large objects, starting the extractor, and loading the freight car.

Turbine Equipment Co., New York 6



German Balancing Machines Measure by Electro-Mechanical Means

Dynamic-balancing machines with electro-mechanical measuring apparatus, imported from Western Germany, are said to facilitate accurate, rapid balancing of high-speed rotating units.

In these machines the reaction of the bearing rolls is transmitted elastically. Any unbalance of the rotating testpiece creates resonant oscillations in the bearings rods, generating an electric current in a solenoid.

A measuring beam connects the bearings with the measuring blocks, which are placed beneath predetermined planes of compensation in the test piece. Springs introduce counter-oscillations into the measuring beam. Two convenient handwheels regulate the magnitude and direction until the unbalance is equalized, cancelling out the oscillations. Accurate, direct readings can be made in 20 to 40 seconds with test pieces ranging from 4 oz. to 13,000 lb.

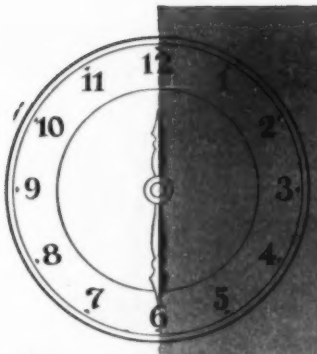
Measuring is done in a state of resonance, achieved by turning a handnut.

Dynamic balancing machines for crank and propeller shafts, etc., as well as static balancing machines, are also available.

Kurt Orban Co., Inc., New York 6, N. Y.

$3,000

...for the half-hour that wasn't there



WHEN a Massachusetts company* surveyed their plant methods, they were amazed to find how much it was actually costing them to keep their machinery lubricated.

The lubrication cost was $14 every day. Added to that was the cost of the half-hour's production time lost every day while the machinery was stopped for lubrication.

This manufacturer called in an Alemite Lubrication Engineer. He recommended a system that *automatically* lubricated all the machinery . . . while it was running! The result: the lost half-hour was converted to productive time and the cost of lubrication was cut from $14 a day to only 21c a day. The total savings are over $3,000 every year.

Call Your Alemite Lubrication Engineer

No matter what size or type of plant you operate, Alemite can show you dozens of ways to save through the more efficient handling of petroleum products. Call your local Alemite Industrial Distributor now or send for the free booklet "11 Ways to Cut Production Costs." Simply attach the coupon below to your letterhead. Dept. C-61, 1850 Diversey Parkway, Chicago 14, Ill. *Name on request

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3. In applying lubricants . . . saves up to 23.9 man hours for every 100 pounds of lubricant applied to bearings.

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(Simply attach to your letterhead)

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We'll include facts on the new Alemite Oil Mist System, too—(OIL MIST atomizes oil into mist, circulates it to bearings under pressure. Increases life of bearings as much as 17½ times).

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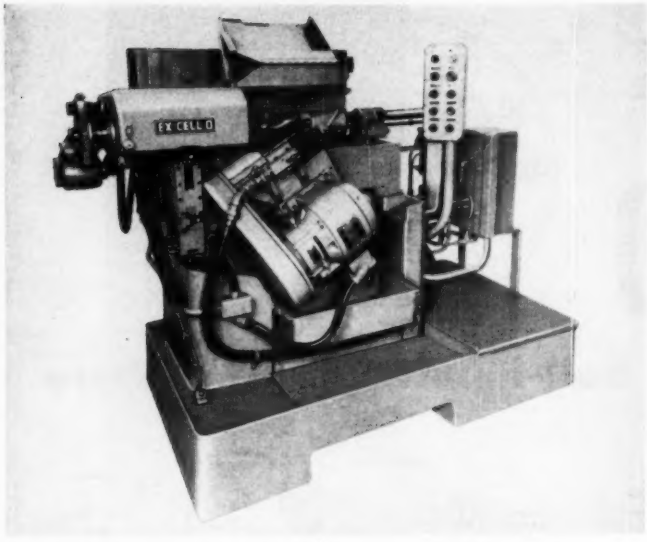


Milling of Jet Compressor Blades

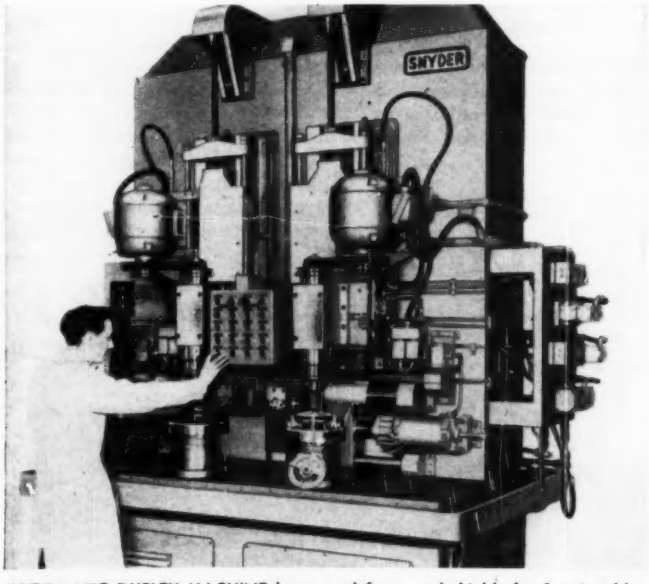
Ex-Cell-O has developed a standard machine for milling the airfoil form on jet-aircraft compressor blades. Both the leading and trailing edges are machined to close tolerance.

The cycle is completely automatic except for loading the work, pressing the start button, and unloading. Blades are located from the finished root form at one end and from a center in the other end. Accuracy of airfoil forms is assured by the use of master cams made directly from the engineer's glass layouts. Coolant equipment has automatic controls.

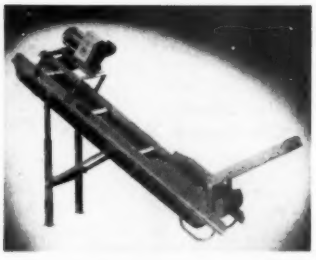
The work is rigidly supported by backrests throughout the cutting stroke. Cutting pressure cannot distort the blade. When the start button is pressed, the headstock, tailstock, and backrests are clamped hydraulically. The work moves lengthwise across the cutter at an adjustable rate of feed, and at the end of every stroke unclamping takes place and the work is indexed.

The amount of movement during indexing and the total number of indexes are determined by the positioning of pins in a plate. After the last cut the machine comes to rest with the work raised from the cutter and the headstock, tailstock, and backrests unclamped.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.



AUTOMATIC DUPLEX MACHINE bores and faces end shields for fractional-hp electric motors. Operations are: finish-turning and facing the rabbet on the OD of the aluminum body and finish-boring the ID of the steel or babbitt hub bushing. Production ranges from 210 to 388 pieces per hr at 75% efficiency. Spindle speed is 4778 rpm; chuck speed 334 rpm. Clamping is automatic by means of a spring diaphragm—unclamping by hydraulic return of the diaphragm. One station is loaded while the other works. — *Snyder Tool & Engineering Co., Detroit 7, Mich.*



Movable Discharge End Put on May-Fran Conveyor

Constructed of welded steel, the Series-S conveyor handles small metal parts such as stampings, castings, borings, turnings, and chips. Because it does not need to be bolted down, it can be moved readily when working areas and plant layouts change. Telescopic legs permit the discharge end to be raised or lowered as required.

It is available in five different lengths: 4, 6, 8, 10, and 12 ft. Twelve-, 18-, or 24-in.-wide belts can be supplied. Standard material is Neoprene-impregnated fabric, but for abrasive or hot metal parts a hinged-steel belting is used.

Positive trap and charging chute is employed. For operations in congested areas, a special swivel charging chute can be attached. This permits feeding within a 180° radius.

May-Fran Engineering Co., Inc., 1677 Clarkstone Road, Cleveland 12, Ohio

No Worry Over Alloy Shortages Here!

Courtesy—Errington Mechanical Laboratory, Inc.

Restrictions in the use of nickel alloys almost brought production of these gears to a halt. Instead, an increasing number of gears are being produced to meet defense requirements—and vital nickel is being conserved. The story contains an idea you, too, may find useful.

The gears, machined from alloy bar stock, form the gear train in a multiple drill head—a versatile, high speed production tool. Precision made to individual specifications, this drill head can drive a number of drills or taps simultaneously, each at its own spindle speed, with only a single work set-up.

The builder—unable to obtain enough nickel moly steel to meet production goals—posed his problem to Frasse Technical Service. Frasse engineers, through wide experience in solving similar problems during World War II, recommended the use of a lean nickel-chrome-moly type, and a heat treatment to suit. The substitute not only met requirements, but was available from Frasse warehouse stock.

Substituting is not a new idea—but are you using it to full advantage? If steel supply is causing you anxiety, why not let a Frasse engineer check "specs" with you? Perhaps he can find you a suitable substitute that's a bit easier to get. There's no obligation. Just write or call your nearest Frasse office today. *Peter A. FRASSE and Co., Inc., 17 Grand St., New York 13, N. Y. (Walker 5-2200) • 3911 Wissahickon Ave., Philadelphia 29, Pa. (Baldwin 9-9900) • 50 Exchange St., Buffalo 3, N. Y. (Washington 2000) • 157 Richmond Ave., Syracuse 4, N. Y. (Syracuse 3-4123) • Jersey City • Hartford • Rochester • Baltimore.*

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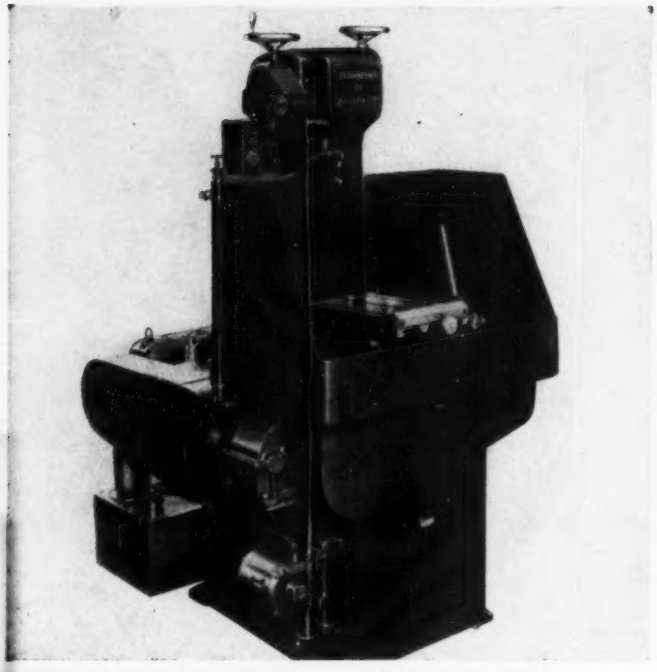


Reciprocating Table, Tilting Holder Put in Hammond Belt Grinder

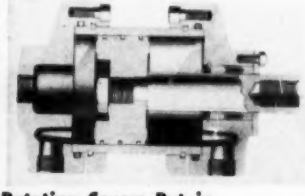
The Model V8-WP, 8-in. wet abrasive-belt grinder production finishes and surfaces ferrous, ceramic, and plastic parts. Thin-sectioned pieces are said to be finished without danger of distortion.

The powered reciprocating table travels on hardened-steel ball-bearing ways. It is driven by V-belt from a small motor to a reducing gear and crank disk. Travel is adjustable from 0 to 8-in. and speed is variable. Tilting workholder makes it easy to bring work to loading, unloading, and grinding positions.

Design of platen makes it possible for the downward pull of the abrasive belt to create a continuous film of coolant between the back of the belt and entire face of the plate. Platen is water cooled to prevent heat distortion of itself and work.

The two coolant tanks have a combined capacity of 35 gal. The grinder can also be equipped with a plain table or manual reciprocating table, and for water-main connection instead of pump and tank unit.

Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo, Mich.



Rotating Covers Put in Rivett Hydraulic Cylinders

Cylinder has covers which may be rotated so that pipe connection and installation can be made in a minimum of space. The covers are held together by keeper rings instead of tie rods.

External O-rings are used as static seals instead of gaskets. Sealing improves with increased pressure. Automotive rings are used on the piston to reduce friction.

Other features are: Self-adjusting composition rod packing. Axial holes through rod bearing provide for pressure disposal on packing members. Seal effect is proportional to cylinder pressure. Rod guide is of bronze; alloy piston rod is ground and polished. Piston rod and assembly alignment is by close-fitting pilot and shoulder. Alloy covers are bored to fit tube dia. Seamless tubing is precision honed.

Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.

Cummins Disc Sanders as Industrial Power Tools

Sanding of any metal or wood surfaces in metal fabricating plants, wood-working shops, foundries, etc., is said to be facilitated by the use of this portable power tool.

It is available in two models, for either standard or heavy-duty work, with either a 7- or 9-in. backing pad.

It is made with a light, compact, cast aluminum frame with a ¾-hp universal ac or dc motor, 115-v standard and 220-v special. Other specifications include precision-cut gears, heat-treated and polished for smooth performance, sealed ball bearings; no-load speed 4200 rpm; and a ⅝-in. spindle dia.

Cummins Portable Tools, Div. of Cummins-Chicago Corp., Chicago, Ill.

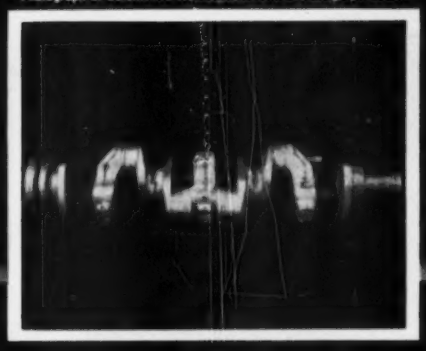
Marks Abrasive-Wheel Dresser Is Boron-Carbide Tipped

The dresser insert is made of Norbide, Norton Co.'s molded boron carbide. This material is harder than tungsten carbide, aluminum oxide, or silicon carbide. Only diamond is harder.

The ¼-in. square by ½-in. long insert fits a 5-in.-long handle. It is specifically for the free-hand dressing of grinding wheels 10 in. in dia or less and of M grade hardness or softer. Price—$2.50.

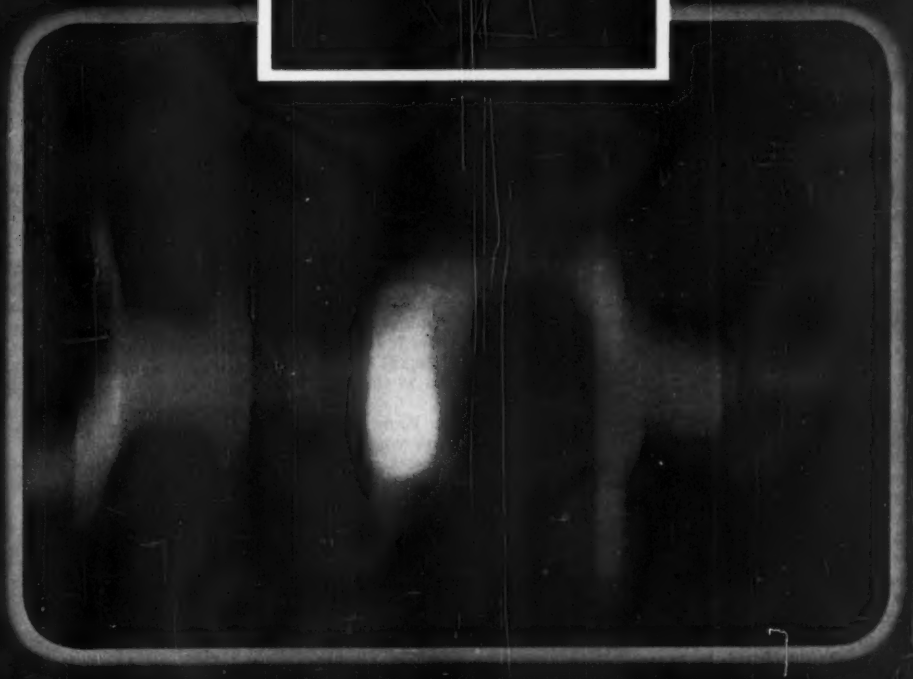
Robert Marks Co., 47 Goddard St., Providence, R. I.

Photograph of automotive crankshaft shown in radiograph below.



WILL IT STAND THE GAFF?

IS IT WORTH MACHINING TIME?



Radiography provides the answers

THERE'S a lot more at stake in a crankshaft than mere pounds of steel. Should it let go, the reputation of the foundry can go with it. Costly machining time can be wasted . . . and great inconvenience caused by a breakdown in service.

Best assurance against failure comes through radiography. With it you can check internal conditions with no damage to the part—make sure that no serious hidden flaw exists.

Radiography has become a regular part of many foundries' routine. It forestalls releasing imperfect castings—helps build reputations for consistently good work. It frequently shows how casting operations can be improved to provide higher yields in production runs.

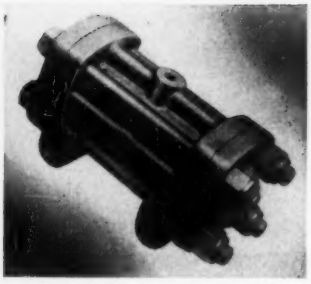
If you'd like to know what radiography can do for you, discuss it with your x-ray dealer. Also send for a free copy of "Radiography as a Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography . . .

another important function of photography

Kodak
TRADE-MARK



Spo's Air Vibrator Moves Granular Materials

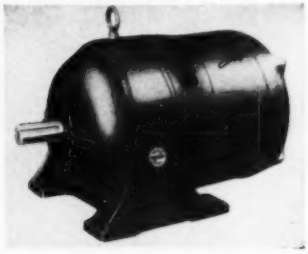
The Spo vibrator, designated series 80, is said to offer an answer to many of the problems of handling powdered and granulated materials. The vibrator can be mounted parallel to the longitudinal direction of material flow to assure positive in-line transmission of sand, coal, ore, slag, grains, and chips. It can also be operated horizontally or vertically with equal efficiency. It is said to work particularly well on chutes, benches, screens, conveyors, and tables.

The vibration action is either intermittent or continuous. It is constructed with a cast semi-steel body, the ribbed ends and connecting bolts being made of alloy steel.

A special corrosion-proof, bronze-alloy cylinder liner is used, assuring thorough and proper lubrication, full-power starting and maximum service-life.

Units operate on 80-psi line pressure, and they measure 8⅜-in. in over-all length, and weigh 21 lb. The vibrator can be furnished to take either a ⅛- or ¼-in. straight or L-type hose fitting in either steel or brass. Other accessories available include automatic air-line lubricator and knee or hand-operated control valves.

Spo, Inc., 6430 Grand Division Ave., Cleveland, Ohio



Foote Bros. and Louis-Allis Combine to Make Gearmotors

The two companies are producing a line of gearmotors in 17 sizes, in single-, double-, and triple-reduction units, having output speeds ranging from 7.5 to 780 rpm. Integral hp ratings from 1 through 75 hp are available.

The motors employ Foote Bros. Duti-Rated helical gears which are claimed to give high performance in load-carrying capacity, wear life, quietness of operation, and compactness of design.

Motor enclosures offered include: open dripproof, splash-proof, totally enclosed, and explosion proof. Both ac and dc motors are offered, as well as motors with special electrical characteristics.

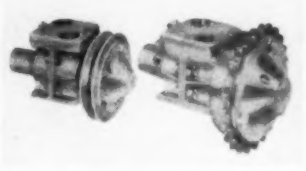
Foote Bros. Gear and Machine Corp., Chicago, Ill., Louis-Allis Co., Milwaukee, Wis.

McCord Grease Lubricator

A force-feed grease lubricator for a variety of applications; it is said to function in the coldest weather and with all types of standard lubricating grease.

It is of simple design, with no valves, springs, or packings and is supposed to work against the highest pressures. The quantity of grease delivered is accurately controlled at all times. Reservoir capacities of 4, 8, and 16 qts. are available with 1 to 24 outlets. Either rotary or ratchet drives can be employed.

McCord Corp., 2587 E. Grand Blvd., Detroit 11, Mich.



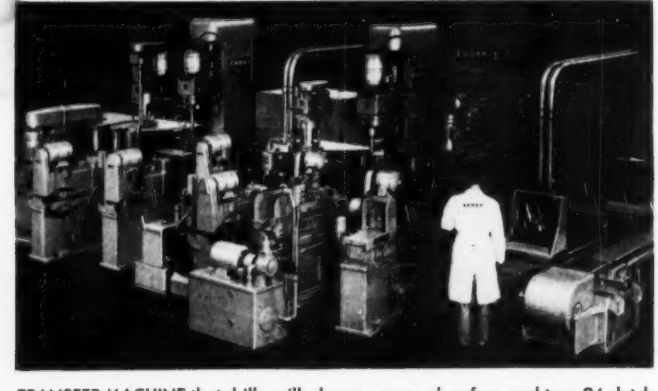
Eco Ball Bearing Pulley-And Sprocket-Drive Pumps

Smaller transmission loads are said to be absorbed by the housing in these ball bearing drive pumps. They are prepacked with lubricant, fully sealed and shielded, and therefore do not require servicing.

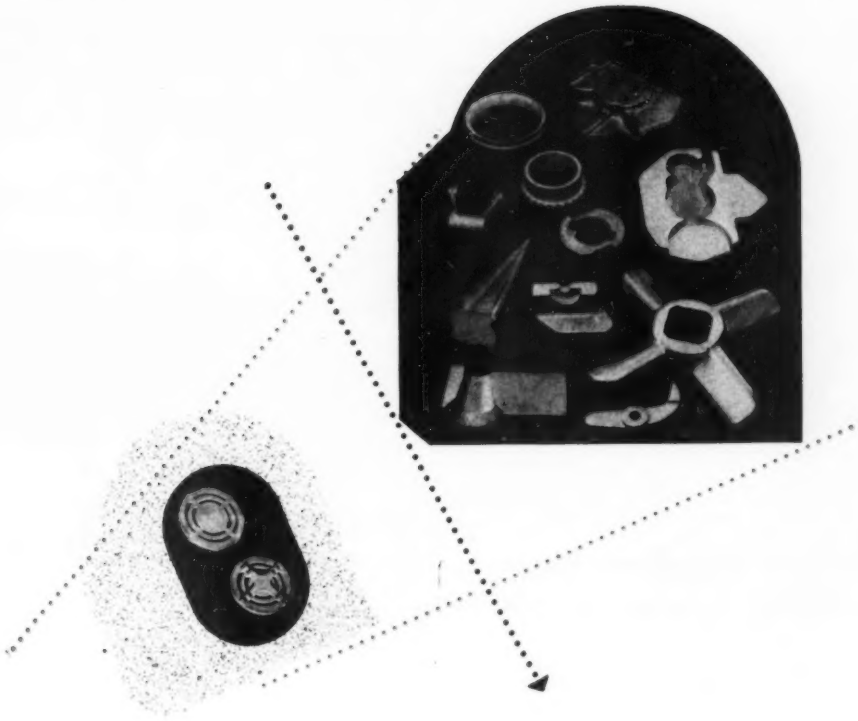
Available in naval-bronze forgings or stainless castings, with capacities from 1/10 to 19 gpm against pressures up to 150 psi. Both pumps are available with a hydraulically balanced built-in bypass, and an adjustable base. Servicing is claimed to be easy—any moving part can be quickly replaced.

The pumps come in four sizes—¼, ⅜, ½, and ¾ in., with speeds from 300 to 3400 rpm. They are reversible, operating in either direction without loss of efficiency.

Eco Engineering Co., 12 New York Ave., Newark, N. J.



TRANSFER MACHINE that drills, mills, bores, reams, chamfers, and taps 94 clutch housings per hr at 9 stations with 100% efficiency. A built-in conveyor removes chips. Palletized fixtures hold housings during transfer. —*Cross Co., Detroit, Mich.*



Airkool Sand Castings

increase valve life **10** *times!*

A big-name refrigeration compressor company recently decided to redesign their equipment to increase the power rating by 33%. That meant the performance of the suction and discharge valves had to be improved. These valves are 3- to 4-inch diameter discs about ¼" thick with a number of radial slots closely controlled in width and shape for regulating gas flow volumes.

These valves were formerly made in cast iron, but frequent breakage in service, and excessive wear ruled out cast iron for the improved compressors.

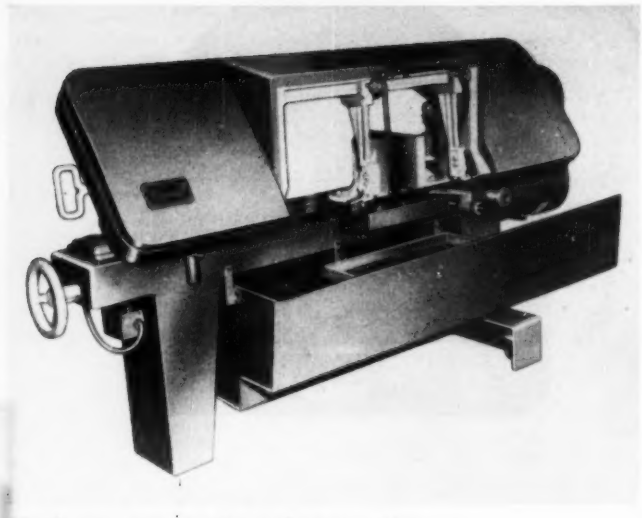
Crucible metallurgists were called in and met the challenge with Airkool Sand Castings specially designed for the valves. Airkool is a Crucible air-hardening tool steel noted for abrasion resistance and excellent non-deforming properties during heat treatment. By closely controlled foundry technique, the slots in the casting were held to the close tolerances needed. Expensive machining was avoided, and the valve not only gave improved performance, but its life was *increased more than 10 times.*

If you have a sand castings application, call on us. CRUCIBLE STEEL COMPANY OF AMERICA, General Sales and Operating Offices, Oliver Building, P. O. Box 88, Pittsburgh 30, Pennsylvania.

CRUCIBLE first name in special purpose steels

51 *years of* *Fine* *steelmaking* **SAND CASTINGS**

REX HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS



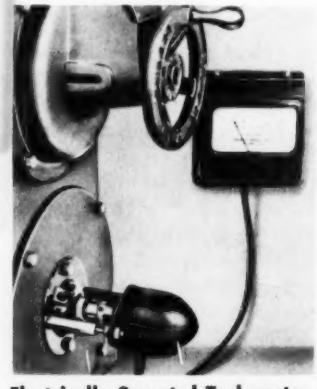
Kalamazoo Bandsaw Has Four Cutting Speeds to 259 fpm

The model 1220 can cut metals up to 12x20 flat, 12-in.-dia round. Four cutting speeds can be selected. A dashpot assures constant pressure during the cut.

Other features are: Swivel-leaf, 45° vise for adjusting cutting angles; quick blade mounting from the top; and an unobstructed view of the cutting from operator's position.

Standard equipment includes a 1-hp, 220/400-v, 60-cycle, 3-phase motor and a stop bar. Dimensions are 87-in. long, 26 wide, and 25½ height to bed.

Machine Tool Div., Kalamazoo Tank & Silo Co., 500-508 Harrison St., Kalamazoo, Mich.

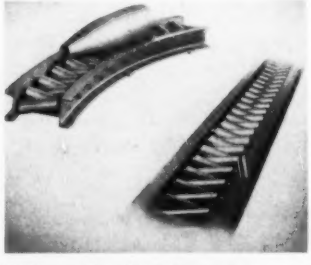


Electrically Operated Tachometer For Reeves Variable-Speed Drives

Tachometer is for use with Reeves variable-speed transmissions and Motodrives, when they must be mounted in inaccessible locations. It is comparable in price to the previous mechanical model and is said to be more accurate. Operation is based on the known ac-generator principle.

The indicator may be mounted as far as 300 ft from the drive. It is claimed to be easily installed on Reeves drives, in capacities from ¼ to 87 hp.

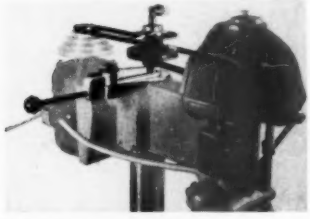
Reeves Pulley Co., Columbus, Ind.



V-Shape Gravity Conveyors For Shell Cases and Projectiles

The conveyor is made in 10-ft sections and 90° curves for easy shipment. Projectiles can be taken off by rolling them over the conveyor guard rail, thus eliminating lifting. Rollers are said to be easily snapped out and reversed should they become worn in one area. The sections can be converted for handling normal products.

Lamson Corp., Syracuse, N. Y.



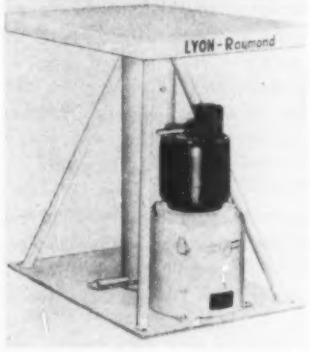
Savage's Speed Selector For Variable-Speed Work

Hand-lever control enables speed changes to be made in belt drives while the machine is in operation. It has been designed to fit 15- or 20-in. drillpresses and other variable-speed applications such as lathes, bandsaws, etc.

The Speed-Juster is a one-unit mounting that uses standard stock belts. The mounting is of cast Tenzaloy and the pulley is die-cast aluminum.

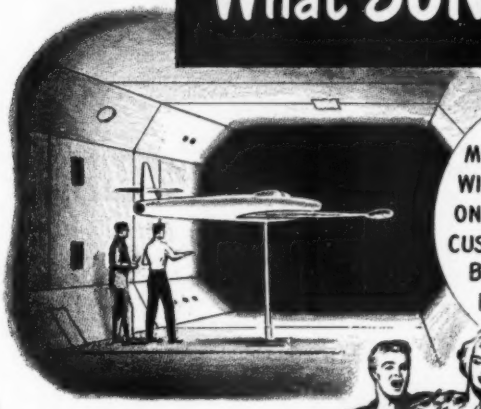
Any desired speed can be obtained as there are no dead spots in the range.

Savage Mfg. Co., Phoenix, Arizona



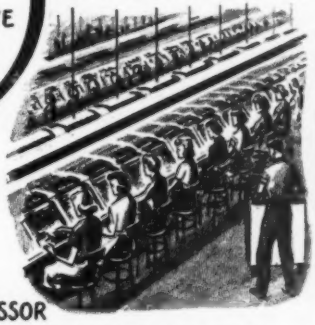
PUMP speeds up raising and lowering of this hydraulic elevating table. A ¾-hp motor drives the unit; pump is controlled by either a pedal or hand switch. Current characteristics of motor meet each customer's requirements. Pump has self-contained oil reservoir. ***— Lyon-Raymond Corp., 47-80 Madison St., Greene, N. Y.***

What SUN has done for others...



STRATEGIC MULTI-MILLION-DOLLAR WIND TUNNEL DEPENDS ON **SUNVIS** TO OIL-CUSHION THE SENSITIVE BALANCE SYSTEM FOR MEASURING STRESSES

MANUFACTURER OF BUSINESS MACHINES COATS FACTORY AIR SUPPLY FILTERS WITH **SUNTAC**-IMPROVES PURIFICATION BY 50%



SUNISO IN THE COMPRESSOR ASSURES ICE FOR MAJOR SPORTS ARENA (ONE REFRIGERATION FAILURE COULD COST THE RINK $25,000)

SUN CUP LC GREASE PROVES EFFECTIVE IN MAST AND HOUSING OF TV AERIALS UNDER ALL WEATHER CONDITIONS-AND UNDER TEMPERATURES FROM-20° TO+150°

RIVER TOWBOAT SWITCHES FROM OIL TO **SUN ADHESIVE PRESSURE GREASE** FOR STERN-TUBE BEARINGS. RESULTS: COMPLETE SUCCESS, LONGER LIFE, BIG CUTS IN COSTS

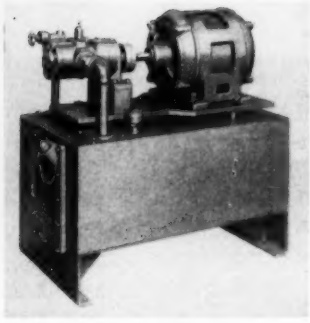
...SUN can do for you!

SUNOCO®

Unusual problems or run-of-the-mill—thoroughly "Job Proved" products are only half the story of their solution. *The other half is correct application.* That's why it will pay you to call in a Sun Industrial representative. His broad experience can mean substantial savings in your operations. Just get in touch with the nearest Sun Office.

SUN OIL COMPANY · *Philadelphia 3, Pa.*

In Canada: Sun Oil Company, Ltd., Toronto and Montreal



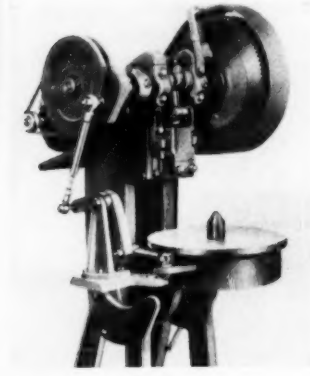
Vickers JIC Power Units

These hydraulic-power units are constructed in accordance with the JIC Hydraulic Standards for Industrial Equipment.

Features are: completely sealed tank, with breather air cleaner and separate filler hole having removable mesh screen and chain-attached cap; elevated tank body with dished bottom, drain plug, and cleanout holes at both ends to permit drainage without spillage; and flush oil-level indicator with high and low positions marked. Motor mounting is simplified by having the plate separate from tank.

The units are available in 3 series, T20, T30, and T60, and 10 models for electric motors from ¾ to 25 hp. Single, double, and two-pressure pumps are used for 100-psi service. Two-stage pumps for 2000-psi service.

Vickers Inc., 1410 Oakman Blvd., Detroit 32, Mich.



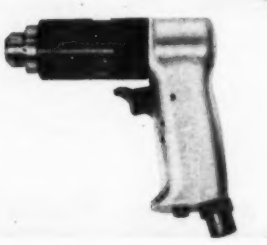
Index Feed on Punch Press Is Accurate to 0.0002 in.

A positive-acting, 5-ton, dial-feed punch press has been added to the Speedex line.

It is a back-geared, O.B.I. punch with a heavy, semi-steel frame. An alloy shaft runs on sealed ball bearings; other bearings are bronze bushed. The pinion and main gear teeth are precision cut. The dial-feed is mounted on the frame and is connected to the crankshaft by means of an adjustable rod with an eccentric drive. It locks in position at each stroke of the press, and releases only after completion of stroke. An adjustable cam on the crankshaft controls the timing of the index feed.

The press is made with either a 1- or 2-in. stroke and can be furnished with either 12-, 15-, or 24-in.-dia index feeds.

O. F. deCastro & Associates, Los Angeles, Calif.



Small Drill With Big-Drill Construction

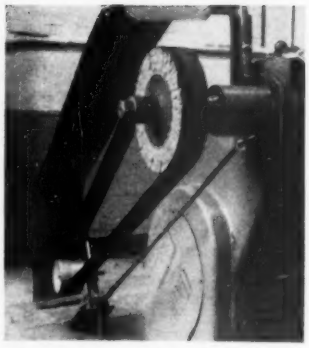
A heavy-duty, air-operated, small drill is said to have many features normally found on larger drills, such as: Stub-tooth gear train for sturdiness and long-life, built-in lubricator for positive lubrication, a sealed spindle bearing and a chuck guard for safety.

The small size, 5¾-in. over-all length and 13/16-in. from the side to the center of the spindle contribute to easy operation in close quarters. The high-speed and maintenance of speed under load makes fast drilling possible. The manufacturer states that the powerful, long-life drill is especially useful in aircraft production and other applications where a large number of small holes must be drilled.

Cleco Div., Reed Roller Bit Co., Houston, Texas

Threading-time slide rule for use with the Cri-Dan single-point semi-automatic threading machine. It will estimate internal or external work, right or left hand, straight or tapered threads of any profile—all of which can be done on the Cri-Dan machine.

Lees-Bradner Co., Cleveland 11, Ohio



Remote-Control Arm for Tracking of Polishing Belt

This arm is for use on backstand installations in conjunction with a Delta idler unit.

By use of the arm, the operator is said to have complete control of belt tracking, particularly in cases where narrow belts and wheels are used—1½ in. and narrower. Downtime is said to be eliminated in cases where the belt guard has to be removed for belt-tracking alignment. The operator can obtain any belt alignment desired from the front position of the polishing lathe.

Behr-Manning Corp., Troy, N. Y.

Neilson Lift Hooks Built Into Packing Cases

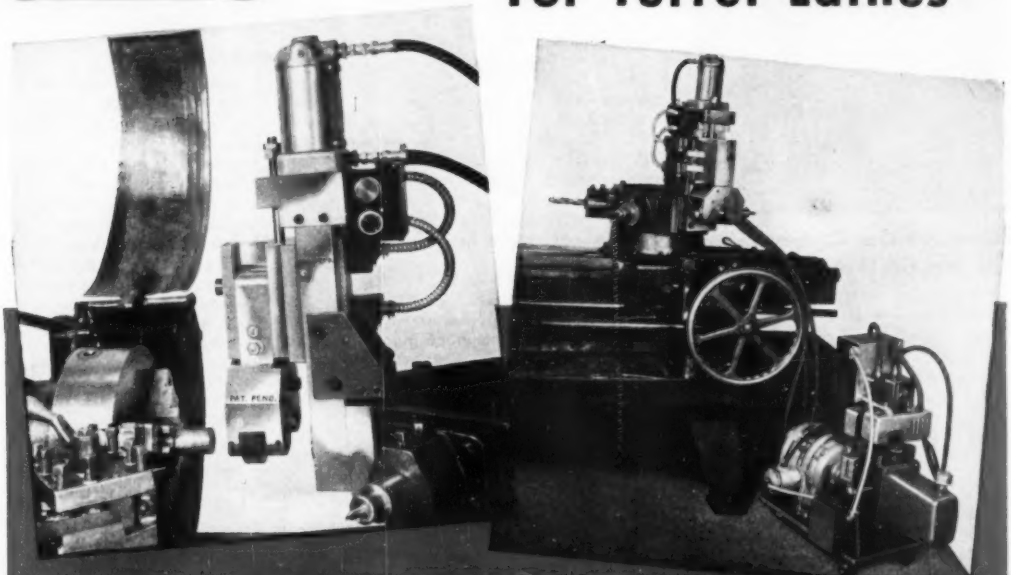
Lift hooks save time, money, and labor when lifting heavy cargo. They are claimed to be the only lift hooks approved by the Army Air Force for engine packing cases.

They are built into the case as a permanent fixture—when not in use they lie flush with the top. Lift of 20,000 lb per set of 4 is claimed, with one company establishing the breaking point as 13,000 lb per individual hook.

Neilson Wheel Co., 1614 N. 12th St., Milwaukee 5, Wis.

NEW-FASTER-MORE ACCURATE

SALVO Thread-Rolling Attachment For Turret Lathes



SALVO ROLLS THREADS IN YOUR TURRET LATHE AT THE TOUCH OF A BUTTON . . . CAN ALSO BE ENGINEERED FOR STRAIGHT LATHES

IT'S THIS SIMPLE! The slide unit is mounted on one of the turret stations. After first operations, the turret is advanced to a pre-set stop and the slide is locked. At the push of a button, the head automatically engages and threads the work piece.

PRODUCTION-PROVED. The Salvo attachment is proving itself every day in the industry—on the tough production jobs—because of these advantages:

- ***SAVES TIME.*** Compare rolled threads which usually require from two to six seconds, with other methods of threading. Threading is done without removing work piece from lathe chuck. No lost time moving work piece to other machines.
- ***INSURES EXACT ALIGNMENT.*** Re-chucking in second machine, with inevitable loss of exact alignment is eliminated.
- ***ADAPTABILITY.*** Entire unit can be adapted to milling, shaving, drilling, and other secondary operations with special attachments.
- ***VERSATILITY.*** Two units, with a single set of controls, can be installed on one turret. The Salvo attachment can also be used with straight engine lathes and other hand-operated machines.
- ***ACCURACY.*** Gives outstanding accuracy on multi-stepped parts with similar close tolerances. Makes the close tolerances of shaving tools available for turret lathes. Pitch tolerances as close as 0.0005 inch can be maintained.
- ***CONVENIENCE.*** Changing rolls or tools takes only a few minutes. Pump unit and tank are mounted on coaster carriage for easy location near machine.

GUARANTEE

We install SALVO attachments on your machine in your plant. If, after a 15 day trial run, you are not entirely satisfied with them, you may return the attachments to us at our cost to you.

THREAD ROLLING AND OIL GROOVING ATTACHMENTS
salvo

SALVO TOOL & ENGINEERING CO.

26441 GRATIOT AVE., ROSEVILLE, MICH. PHONE: PRESCOT 6-4700

CHICAGO OFFICE—549 W. WASHINGTON ST., CHICAGO 6, ILL., PHONE: FINANCIAL 6-0913
BRIDGEPORT OFFICE—857 E. MAIN ST., BRIDGEPORT 8, CONN., PHONE: BRIDGEPORT 6-6988

Knoop or Vickers Hardness Tester Has Range up to 10,000 Grams

The Kentron tester can be used for making Knoop or Vickers hardness tests on such varied material as metals, fine wire, plastics, glass, paint, and ceramics.

The testing load range of the instrument has been increased 10 fold. Dead-weight loads from 1 to 10,000 grams can now be applied. Application of the loads is controlled by an oil dashpot with a preloaded mechanism to prevent backlash.

The test specimen slides underneath objectives with up to 1000X magnification — without disturbing the original focusing of the microscope.

A new vise for holding mounted specimens fits into the mechanical stage. By aligning the vise index with an index inscribed on the specimen mounting and recording the micrometer readings of the X and Y axis on the stage—impressions can be located readily any time after the original testing.

Leveling of the tester is provided by 3 supporting pads. When required, the pads can be arranged for shock or vibration mounting.

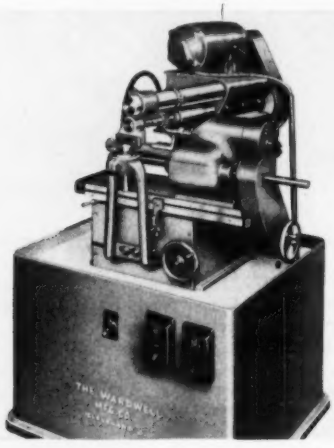
Kent Cliff Laboratories, Peekskill, N. Y.

Gale Dorothea Turntable

Light-duty turntable called the Turn-More is only 2⅞ in. high. It has long bearing centers and supports the load on a ball bearing.

Sealed synchronous motor powers a geared off-center drive. Speed is 2 rpm. Because of the positive drive, table can be tilted or run vertically. Variations possible with their respective load ratings are: horizontal rotation—5 lb with 10-in. disk; vertical—1 lb with 10-in. disk; upside-down—special bearings and bracket needed for light loads.

Gale Dorothea Mechanisms, Elmhurst, Long Island



Wardwell Flute Miller Has Automatic Indexing Head

A flute miller, hydraulically operated and automatically index fed, can mill straight or spiral flutes in taps, reamers, counterbores or any small cutting tools from ⅛ to 4 in. dia with from 2 to 40 flute spacings.

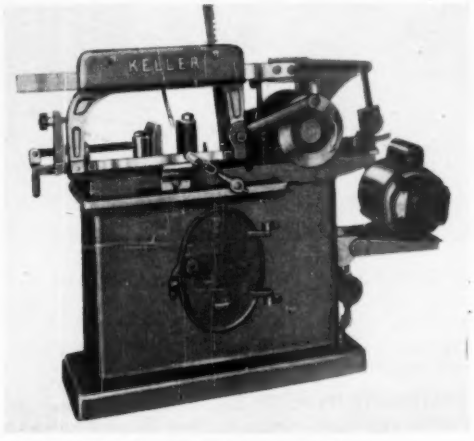
The spindle is quill mounted on anti-friction bearings, and has a No. 9 B&S taper for attaching cutter arbors on end mills. For spiral fluting, the spindle in its housing can be tilted up to 45°. It is driven by a double V-belt off a ½-hp Lima motor with 4 speeds.

The table is adjustable up to 9 in. of travel and is automatically operated by a hydraulic motor dog with a feed of 1½ to 30 ipm.

The indexing head is equipped with an automatic locking device on the work arbor. The interchangeable leadscrew for various types of spiral milling is operated by a chain gear at the end of the work spindle. The index head can accommodate Erickson, collet chucks, or other holders, and for taper fluting can be tilted. It is adjustable on the table without disengaging the chain gears.

The machine is equipped with an index plate, a locking plate, a spiral lead gear, a motor-driven gusher coolant pump, and a hydraulic, 1½-hp, 1200-rpm motor unit. Wrenches or any other tools for special work can be ordered.

The Wardwell Mfg. Co., Cleveland, Ohio



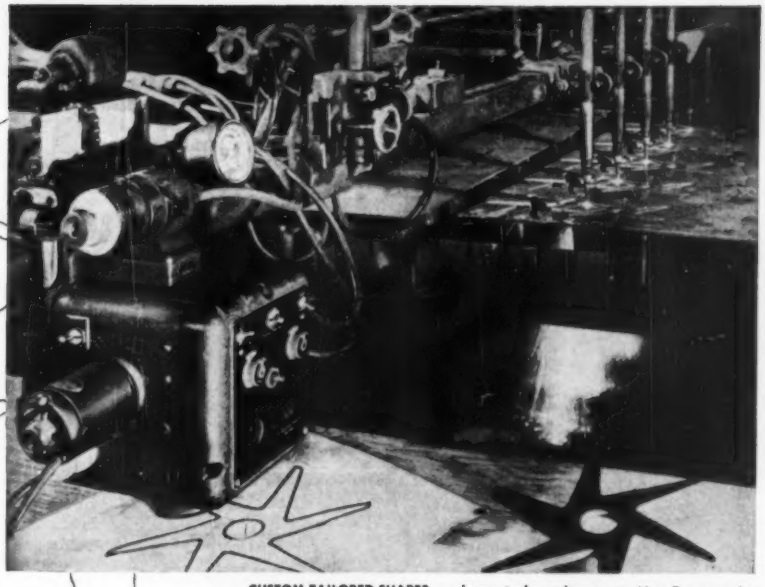
Keller Power Hack Saw

The model 3CH will handle up to 6¾x6¾ in. work. It is equipped with a swivel vice, automatic feed system, and automatic stop. Either 12-or 14-in. blades can be used. There are two speeds to choose from—70 or 126 rpm.

Other features are a 6-in. stroke, a built-in coolant tank in base, and Oilite bearings. Power is furnished by a ½-hp, single-phase motor.

With the addition of this model the Keller line now totals 8 models covering a price range from $97.50 to $497.50.

Sales Service Machine Tool Co., 2363 University Ave., St. Paul Ave., St. Paul 4, Minn.



CUSTOM-TAILORED SHAPES...a large steel warehouse uses Airco Travographs, equipped with Electronic Tracing Devices to produce an almost endless variety of steel shapes...custom-cut singly or in quantities with full precision and accuracy—providing them a time-, trouble- and money-saving customer-service.

simple outlines . . . intricate shapes cut to "AIRCO ACCURACY" *with*

AIRCO'S ELECTRONIC BLOODHOUND

Airco's new electronic tracing device, popularly known as the "Electronic Bloodhound", brings new economy and flexibility to machine gas cutting operations.

Designed for use only on Airco Oxygraph and Travograph gas cutting machines, the "Electronic Bloodhound" needs only an outline drawing or silhouette for a guide. One such low-cost, easily-prepared drawing or silhouette is sufficient whether one, a hundred, a thousand or more parts are to be cut in any design . . . from simplest to most intricate—inside and outside *square* corners, obtuse and acute angles, narrow slots, long slim projections, and many others. The Airco electronic tracing device follows the outline *automatically* to effect such accuracy of cutting that in most cases further machining is unnecessary.

For further data about this outstanding contribution to machine gas cutting, call or write your nearest Airco office today.

AIRCO **AIR REDUCTION**

AIR REDUCTION SALES COMPANY • AIR REDUCTION MAGNOLIA COMPANY
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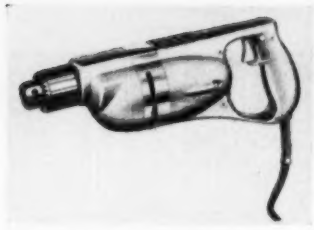
Divisions of Air Reduction Company, Incorporated
Offices in Principal Cities



Cummins Portable Drills

The Model-430 standard-duty drill is claimed to be an effective all-purpose shop tool. It drills 5/16 in. in metal, ¾ in. in hard wood. No-load speed is 1000 rpm. It is equipped with a Jacobs geared chuck Model 30B; measures 12¾ in. over-all, and weighs 6½ lb.

Model 435 has a capacity of ⅜ in. in metal, ¾ in. in hard wood; no-load speed of 750 rpm; Jacobs geared chuck Model 32B; length 13¼ in.; and weight of 6½ lb.

Both drills have a universal motor for dc or ac up to 60 cycles—115-v standard, 220-v special; 2-pole switch, momentary contact; and a die-cast aluminum frame. The double-reduction gears are of hardened steel, helical cut for smooth operation.

Cummins Portable Tools, div. Cummins-Chicago Corp., 4740 Ravenswood Ave., Chicago 40, Ill.

Boydell Pearlcrome Finish Subs for Electroplating

A baked finish made from Pearlcrome costs 20% less than present nickle-chrome electroplating. The finish is especially valuable at the present time because nickel can no longer be used for decorative parts. One auto maker is using it for truck trim, and may use it on cars except for the bumpers.

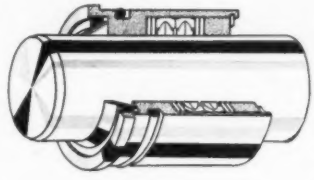
There are 2 systems of application that can be used—the 2- and 3-bake processes. The one normally used is the 3-bake system and will be described here.

Baking the primer is the first operation. It should be reduced 15% by volume with an aromatic petroleum solvent to a viscosity of 15-16 sec in a No. 4 Ford cup. A smooth coat of ¾-mils dry-film thickness should be sprayed. It can be baked in a steam, gas, electric, or infra-red oven at temperatures ranging from 10 min at 325 F to 45 min at 250 F. The metal should be Bonderized for all exterior parts.

A coat of 17-24 Pearlcrome base reduced 20% by volume with Xylol or similar solvent is sprayed on next. This should be a light coat, so that the dry-film thickness is only about ½ mil. It is allowed to flash for about a minute and then a coat of 49-300 Pearlcrome Slurry, reduced one part to 11 of Xylol is sprayed on. Fifty lb of air pressure and 10 lb of liquid pressure should be used to avoid dry spray. The base and slurry are baked at the same temperature as the primer. The painted parts should not be tackrigged but simply blown off.

In operation 3, a coat of No. 17-25 Pearlcrome clear reduced 20% by volume with Xylol is sprayed on. Coat should be 1-mil dry-film thickness. Recommended baking temperatures range from 18 min at 270 F to 45 min. at 230-250 F.

Boydell Bros. White Lead & Color Co., 432 E. Lafayette Ave., Detroit



Air-Cylinder Cartridges Combine Packings, Bearings, Rod-Wipers

A replaceable cartridge-type, packing unit for pneumatic or hydraulic cylinders is said to provide a solution for many assembly and maintenance problems.

All necessary packings, bearings, and rod-wipers are combined in one compact unit. A readily accessible snapring confines all the components within the cylinder head.

The adjustment-free cartridge is available for light- or heavy-duty service in 3 distinct designs, for rod sizes from ⅝- to 3½-in. dia.

Hydraulic Accessories Co., Detroit, Mich.

Miniature Ball Bearing Smaller Than Pinhead

The bearing has an outside diameter or 1.5 mm. Diameter tolerance is held to plus zero and minus 2 tenths. To achieve these tolerances, measurements are made with instruments accurate 20 millionths of an in.

The pivot shaft holds the balls in place. The raceway wall is designed so that its mass occurs at points of greatest strain. This permits relatively high loads under severe shock and vibration. Because of this property, the bearings are reported to be replacing jewel bearings for instruments used under such conditions.

Miniature Precision Bearings, Inc., Keene, N. H.

Airmatic Double Solenoid Valve

A corrosion-resistant, double-operated solenoid valve for operation of double-acting air and low-pressure hydraulic cylinders where pressure must be held on one side of the cylinder for a specified time. Built-in flow controls govern the speed of the cylinder.

Momentarily engaging a single solenoid reverses the valve, with the cylinder held in position without holding either solenoid energized. Power failure will not reverse the action. A one-piece, stainless-steel spool carrying an O-ring seal is the only moving piece. Easily removed protecting caps on the solenoids facilitate maintenance.

The valve, made without springs, is available in ¼-in., ⅜-in., and ½-in. full-orifice area in either base- or pipe-mounted models.

Airmatic Valve, Inc., Cleveland, Ohio

Blast-cleaning machines, the Models ES-400 and ES-382, simplify and speed up the removal of dirt, rust, paint, and other foreign matter from 30- and 55-gal. returnable steel drums. Metal abrasive is hurled against the inner and outer surfaces by centrifugal force created by vaned wheels revolving at 2300 rpm. The drums are automatically handled—only one man is required to load and unload.

Pangborn Corp., Hagerstown, Md.

Control center enables a group of motors to be independently or interdependently regulated from a central location. Known as Multitrol, the station is built to AIEE and NEMA specifications. It will accommodate any system up to 600 v, using components no larger than NEMA size 5. Magnetic, reversing or non-reversing; multi-speed; primary or secondary resistance and autotransformer starters are available.

Ward Leonard Electric Co., Mt. Vernon, N. Y.

PRESSING ...

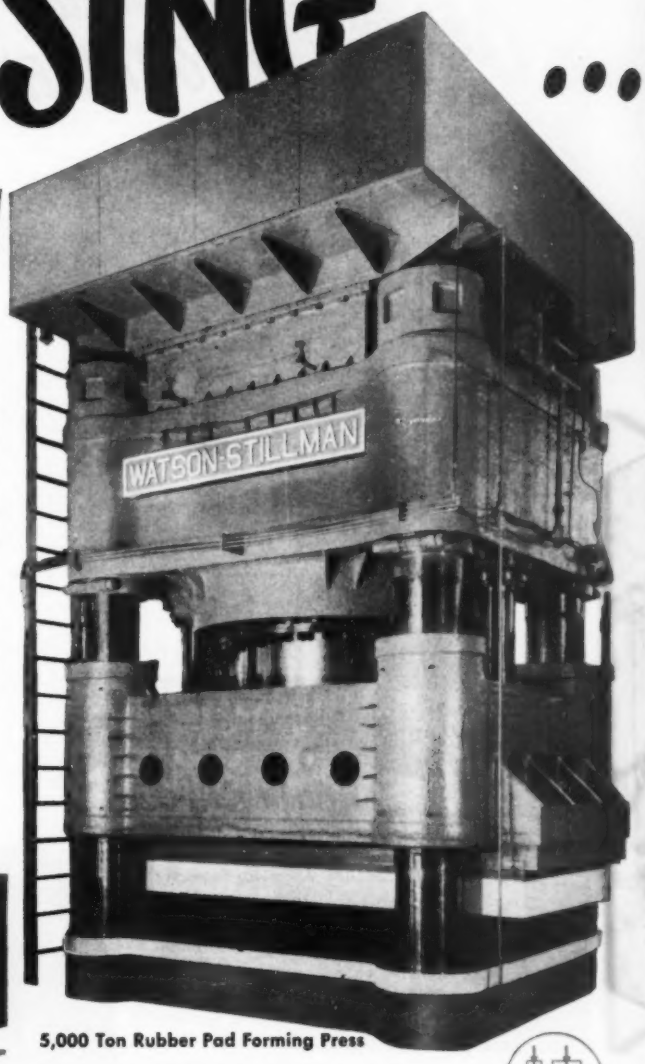
out the ARMS for UNCLE SAM!

Planes . . . tanks . . . guns . . . shells . . . shell cases or any one of a thousand and one other items that must be produced, as long as it can be pressed out of metal, there's a W-S Press to do the job . . . and more economically, too.

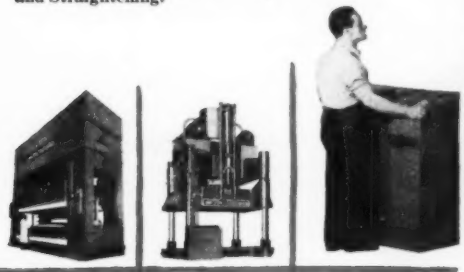
W-S Medium and Deep Draw Presses do things faster. Rejects are virtually eliminated . . . present dies and materials can be used . . . one or more draws may be cut from a progressive operation, thereby saving man hours on the job . . . intermediate annealing is often reduced or eliminated and total production time cut down.

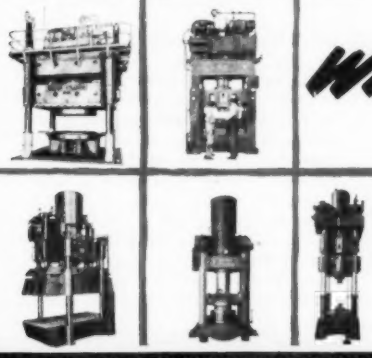
Designed for precision work and built for long service, these W-S Hydraulic Presses offer further advantages in set-up, maintenance and tool life. Available in a large choice of pumping units and controls. It will pay you to investigate their flexibility.

Other W-S Metal Working Presses include those for Forming, Flanging, Trimming, Forging, Coining, Hobbing, Extruding, Briquetting, Bending and Straightening.



5,000 Ton Rubber Pad Forming Press





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WATSON-STILLMAN Established 1848

Factory and Main Office: 163 Aldene Rd., Roselle, New Jersey

Branch Office: 228 No. La Salle St., Chicago, Illinois

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Indianapolis 20, Ind. . W. K. Millholland Mach. Co.
Los Angeles 11, Cal. . . . . H. M. Royal, Inc.
Pittsburgh 19, Pa. . . . . Stanley Berg & Co.
Portland, Ore. . . . . Machinery & Tool Supply Co.
Rochester 12, N. Y. . . . . Watson-Stillman Co.
San Francisco 7, Cal. . Schellenbach Mach. Tool Co.
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W-S "COMPLETELINE" HYDRAULICS . . . THE SHORTEST DISTANCE FROM PRODUCTION TO PROFITS

9-1-17

Celebrating the birthday of a BRIGHT IDEA!

SIMONDS ABRASIVE CO.

Grinding Wheels

Switching to Simonds Abrasive Company grinding wheels sure turned out to be a production-boosting, bottleneck-busting idea in the grinding department . . . a bright idea still paying off in faster filled DO's and better efficiency. You'll find everything you need for improved efficiency in Simonds complete line . . . grinding wheels, mounted points and wheels, segments and abrasive grain . . . top quality products accurately specified and made by Simonds Abrasive Company . . . a major manufacturer of grinding wheels for almost 60 years. Write for free data book and name of your distributor.

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Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

ROUND TABLE Discussion

BARGAIN SHOPPER

The average workman is not so situated that he can afford to be without work for more than a short period, and should not be blamed for casting about when he has the opportunity among other employers from whom he has reason to believe he can procure an increase in his salary. It is only prudent on his part to find out if he can do so while he is with his present employer. However, he should not feel justified in leaving his present position without giving sufficient notice so his employer may arrange to replace him.

It may not be on account of pay alone that a workman may desire to make a change. It might be to get a better class of work, prospect of more steady employment, or other reasons may be causing him to desire a change.

While an employer might not feel wholly justified in hiring help from a neighboring employer, he should know the reason for the man's seeking employment and should insist that the new man coming from a competitor should have given sufficient notice of his leaving.

While pay alone is not all that should be considered by either party in a contract, it is usually one of the most potent matters for consideration.

H. B. Martin
Watervliet, N. Y.

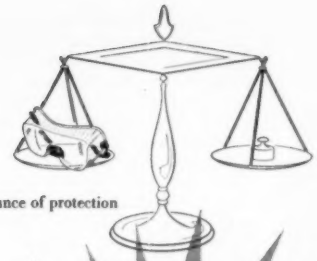
OFF AGAIN, ON AGAIN

Do we still have foremen like Ed in these modern times? I thought this type of foreman went out with World War I, when I learned my trade!

Perhaps Ed is not familiar with statistics. Today's statistics show that it costs from $1,500 upwards to hire a good tool and die maker. Possibly this is over Ed's head, so I will try to explain:

The mere fact that Ed entrusted a new man with a special tool, and a valuable one at that, showed poor judgment. Take Ed, myself, or any other tool and die maker and put him in a strange shop doing strange work, and we all would feel out of place and uneasy for a week or so.

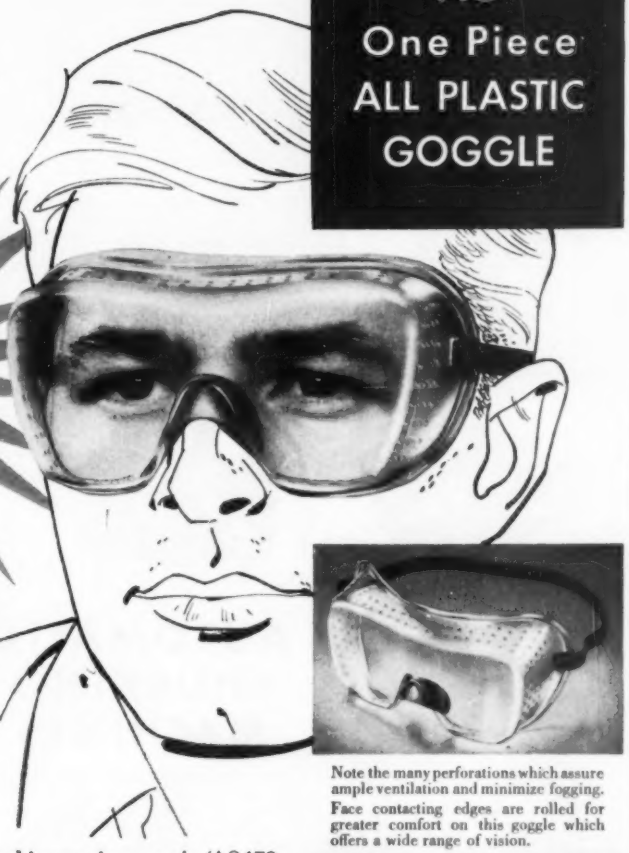
Why not practice the Golden Rule? Give the new man an easy task for the first few days and let him acclimate himself; then give him some-



One ounce of protection

AO's NEW INEXPENSIVE ALL PLASTIC GOGGLE

AO One Piece ALL PLASTIC GOGGLE



- LIGHTWEIGHT
- NON-FOGGING
- WELL-VENTILATED
- NON-FLAMMABLE
- WELL-FITTING

Note the many perforations which assure ample ventilation and minimize fogging. Face contacting edges are rolled for greater comfort on this goggle which offers a wide range of vision.

Goggle fits comfortably over most personal glasses with nosepiece hugging nose snugly.

Made of impact resisting plastic, this one-piece goggle (AO479 Clear, AO480 Green) is "optically correct" and meets government specifications. It affords exceptional wide angle vision and can be worn over most standard types of personal glasses and most prescription spectacles and goggles. Recommended for protection against foreign particles striking from any direction on the following types of work: babbiting, chipping, cutting rivets, grinding, hand-tool operations, machine operations, spike driving and similar operations. Your nearest AO Safety Products Representative can supply you.

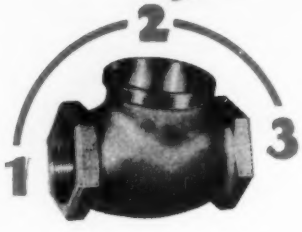
QUICK FACTS
479-480 GOGGLE

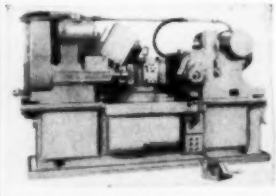
- One size only but designed to fit all faces comfortably
- Elastic headband, easily adjusted
- 4 point contact to face of wearer, resists rocking
- Plastic nosepiece fits all noses comfortably and snugly
- Rolled edges for comfort, better fit in contacting face
- Order by number 479 Clear
- Order by number 480 Green

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

Single set-up covering
ALL finishing operations...
MEANS GREATER ACCURACY *with* **GOSS DeLEEUW**





AUTOMATIC CHUCKING MACHINES

One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & De Leeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & De Leeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

thing more complicated to perform.

It surely does not take a good foreman, if he is a skilled mechanic himself, more than a week to find out what kind of a skilled mechanic he has. The foreman need not be breathing down the new man's neck to find out, either.

This man, Ed, reminds me of the foreman I once had who learned his trade in the shop, got to be foreman, was so cock-sure of himself that he thought he knew all the answers, though he never worked in another shop.

He is still there, and one of the wags in the shop prophesied that he would eventually be buried on the factory roof. Ed better get next to himself and change his antiquated ways or else he will end up on the factory roof.

Al J. Lamprecht
St. Louis, Mo.

•

When a man starts work in a new shop, he is unavoidably under something of a strain, however cool and collected he may appear to others.

The surroundings are bound to be somewhat different, and he must necessarily feel his way to a certain extent for a time. However, capable and experienced he may be, his mind is under an increased tension that time only can dispel.

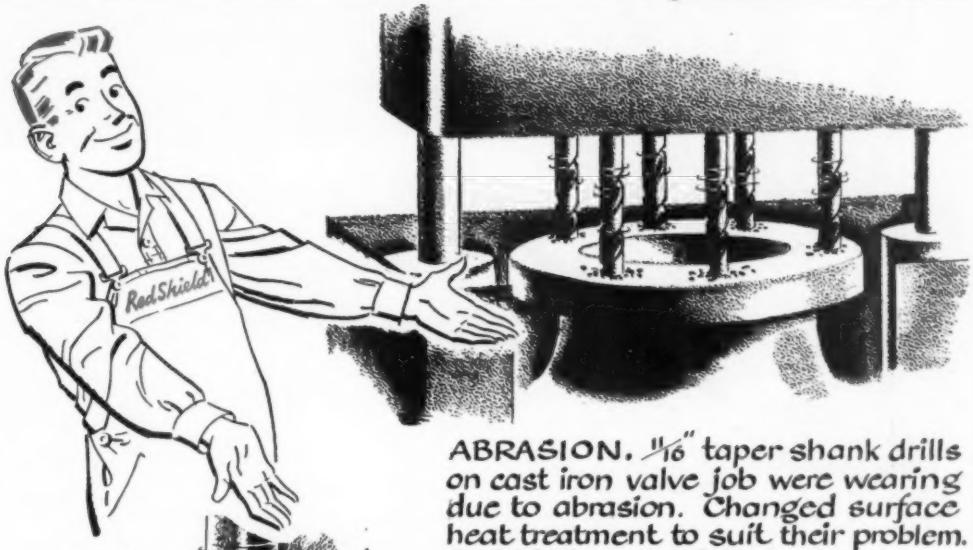
If he has the nerve to put on a bold front, as some do, the foreman should not be deceived, but should realize how anxious the new employee is to make a good showing. His nerves being at high tension, try as he may, it is next to impossible for him to do his very best until he has time to get thoroughly used to his new surroundings.

If the foreman thinks he has reason to trust a new man with a job requiring unusual skill, he should realize that he is taking a risk for which he is at least as much to blame as is the workman who may spoil the tool or the job. He certainly should not attempt to place all the blame on the new workman.

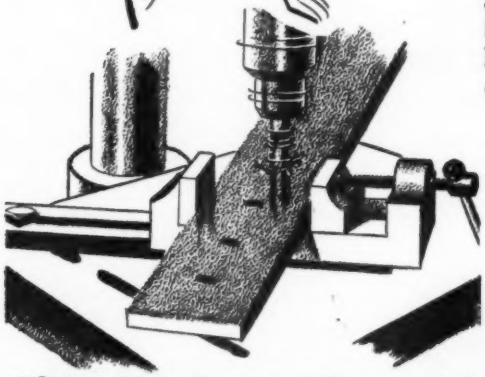
If, for any reason, the foreman decides that he must place such important work in the hands of a new employee, my opinion is that he, the foreman, should bear all the responsibility for results. In the case of unsatisfactory ending, he, the foreman, should accept the full responsibility and not fire the new workman, but give him a further trial on a job where less risk is involved.

John Mark May
Watervliet, N. Y.

DRILLING POINTERS..... by Red Shield



ABRASION. 11/16" taper shank drills on cast iron valve job were wearing due to abrasion. Changed surface heat treatment to suit their problem. Drill life increased beyond all expectations.



STAINLESS. Regular drills averaged 3 holes per grind in tough work-hardening stainless steel. We suggested No. 506 F Fast Spiral Drill with special heat treatment and point. . . .Now get more than 90 holes per grind.

SERVICE. 70 years' experience behind our Red Shield Service Staff...to help solve your metal cutting problems. Get in touch with your local Standard Tool Co. distributor.

STANDARD TOOL CO. DEPT. 1-A, 3950 CHESTER AVENUE CLEVELAND 14, OHIO

STANDARD TOOL CO.

New York • Detroit • Chicago • San Francisco

THE STANDARD LINE: *Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*

EVERY BRANCH OF THIS FAMILY TREE
IS A PROFIT-MAKER!
The Most Complete Line of
Carbide Cutting Tools
The root of success on hundreds of jobs can be traced to W-S tools — designed for increased production, lower tool cost and greater accuracy. A complete range of sizes . . . wide selection of styles . . . straight or taper shanks. Quick delivery from your nearest Wendt-Sonis distributor.
FREE! Reaming Instruction Chart that determines feeds, speeds, and stock removal for reaming steel, ferrous, non-ferrous and non-metallic materials. Write WENDT-SONIS COMPANY, Hannibal, Missouri.
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CARBIDE CUTTING TOOLS
BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS
DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS
ROLLER TURNING TOOLS • SPECIAL BITS

HEAD BEATS HANDS

First let us not say that Laziazell is just a lazy guy. If he uses his brains, then he is definitely *not* lazy. Why this approach? Mainly because we must not think of men who develop shortcuts as being lazy; and for another reason, a man who works only with his brain such as an accountant, lawyer, or company president is certainly not an individual to be classed as lazy.

Men who make the job easier should not be looked down upon. These men oftentimes give the appearance of being too lazy to work. Their fellow workers however, frequently admire the fact that in a day's time about as much work is turned out by our lazy worker as by the man who makes lots of motions.

This brings up another point. All men who make a big to-do about work, who make the boss THINK they are working hard are not actually accomplishing much in some instances. They have many wasted motions and frills to impress people that actually slow down their overall effectiveness. So it is not the case of a lazy man being compared with a worker that needs to be analyzed, but rather the personalities and productive ability of the two men.

We know that there are people in this world who will not work. Even when given a job they refuse to exert any effort. These people are lazy. This type of laziness breeds no good, and is the groundwork for the forces of socialism. Men who are lazy want something for no effort expended. They want security founded on the misconceived idea that it can be had without personal effort. This type

"The missus heard we needed dust collectors and insisted on making a donation."

TEXTILE MACHINE PART LASTS THREE TIMES LONGER... *when made of* *Republic Alloy Steel*

NOT ALWAYS is it possible to improve a product and at the same time cut its cost. But the Warner & Swasey Company did just that by changing design of a textile machine part—a change made practical through the use of Republic Cold Drawn Alloy Steel Bars with Carbon Correction Annealing.

The part, known as a "faller bar," looks like a comb, and is used to control nylon, rayon and wool fibres in the drawing process. When the design was changed from three-piece to one-piece construction—exclusive of the needles—welding and weld grinding were eliminated. Furthermore, the fine cold drawn finish free from decarburization required no surface grinding.

New high strength of the part permitted an increase in machine speed. Wear was reduced—bending and twisting practically eliminated. Rejects were reduced.

And—probably of greatest importance—life of the part was increased more than 200%.

Maybe the high strength, toughness and hardenability of Republic Alloy Steels combined with the advantages of cold drawing and carbon correction are just what your product needs. Why not invite a Republic metallurgist in to talk it over?

REPUBLIC STEEL CORPORATION

Alloy Steel Division • Massillon, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO

Export Department: Chrysler Building, New York 17, N.Y.

Republic **COLD DRAWN**

REPUBLIC STEEL

ALLOY STEEL BARS

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

PACKAGED BRASS AND STEEL SHIM STOCK

Ready for instant use without fumbling or waste

Packaged shim stock means *convenience!* No clumsy handling or spoilage of large bulky sheets or rolls. In our dispensing cartons and packets the stock is always protected, yet always available for immediate use. Just pull the length you need out of the carton slot—and snip it off. Saves time, saves space!

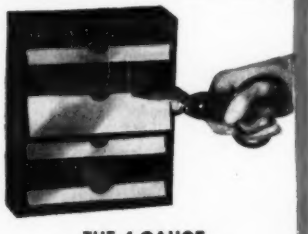
There's a handy carton, packet or rack designed for your requirements by the makers of the famous LAMINUM Shims

RUGGED CARTON DISPENSERS

6 x 100 inch rolls in metal-edged cartons. Stock feeds through carton slot, as required. No re-rolling, no ruined stock. Available in 11 gauges: .001, .0015, .002, .003, .004, .005, .006, .007, .008, .009 and .010 inch.

STURDY FLAT PACKETS

Two 6 x 25 inch sheets to the envelope. The heavier gauges—which do not roll easily—are supplied in special protecting flat packets: .012, .015, .020, .025 and .032 inch.



THE 4-GAUGE ECONOMY CARTON

Four 6 x 50 inch rolls in one carton. The utility unit, containing the four most popular gauges: .001, .002, .003 and .005 inch. The same first quality brass or steel shim stock.

THE METAL DISPENSING RACK

Holds the four gauges of your choice. Pick the four gauges you use the most. Rack is designed to hold the 6 x 100 inch carton dispensers. Sets on bench or hangs on wall.

Check with your industrial distributor!

LAMINATED SHIM COMPANY, INC.

3106 UNION STREET — GLENBROOK, CONN.

SHIM STOCK

STAMPINGS — CUSTOM SHIMS — AN·COR·LOX NUTS

of laziness cannot be tolerated by industry, and usually such men are soon weeded out. Of course, today, under increasing labor conditions, more of these definitely lazy people will probably be hired, and we must make the best of it.

These people can be handled, but not effectively. They present a problem from both productive capacity and, most of all, from a safety angle. They do not even think for themselves. This type of employee is not the person mentioned by Al. Al speaks of a man who by virtue of brain-solving-brawn problems has earned himself the title of lazy. Actually, this man we are talking about works harder than most of us realize. He is thinking as well as working manually. This is a task that too many of us do not do. We accept our jobs without trying to improve them. Sometimes the jobs master us. We slave at the task and work hard only to see Laziazell getting ahead by what appears to be loafing. He sits dreamy-eyed doing his work at a rate which, when the day ends, finds his production as high, if not higher, than ours.

Why? Mainly because this man live easily. He doesn't want to hurry. He dislikes rush, and he thinks out how he can improve what he is doing so that it will be easier for him. He serves as a methods man for industry. . . . a man who is not paid for that job, but does accomplish the end results.

So let us not forget that there are two types of lazy men. One who will not work if he can loaf; the other who will work, but will also THINK and accomplish things with less effort. This is a trait worth cultivating. Take heed of your lazy men and reap the benefits offered by them.

Charles D. Townsend
West Hartford, Conn.

•

Is laziness always a sin? It all depends on the construction one puts on the word "lazy." If a man is physically lazy, yet mentally alert, on some jobs he may easily outstrip the man endowed with an abundance of physical energy but handicapped by a deficiency in grey matter. The production race is not always to the swift nor the battle to the strong.

Most production executives are familiar with the seemingly slow, indifferent operator who is complete master of his machine, never flurried or het up over the difficult job when it comes along, always maddeningly cool and collected when others would be excited and keyed up. Calm and collected, he analyzes the difficul-

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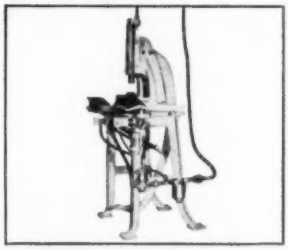
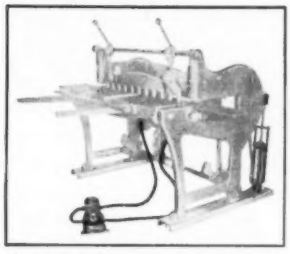
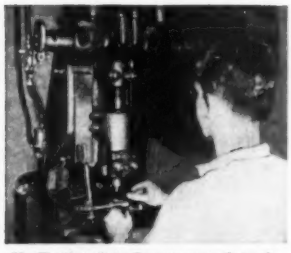


Kick Press Controls—substitute more efficient air power for foot power—thus eliminating fatigue, spoiled work. Work is more uniform and is delivered at an increased rate. There is a Schrader pneumatic control for hand operation, foot operation or both.



Shear Controls — eliminate awkward and tiring foot leverage. With the portable pedal one man can now position the work and operate the shear. Extra force enables one man to shear heavier gauge metals and increase production.



Air Ejection Sets—Remove parts from the die by an intermittent blast of air. Can be timed to deliver a blast of air from a fraction of a second to any desired length during or after the cycle.

In addition to the above Controls, Schrader can furnish a pneumatic control to fit most any requirement.

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The greater safety possible with this control gives operators more confidence in their machines, results in more and better work. After a few hours of operation with this control a rhythm is acquired that will give new speed to your operators . . . a rhythm that is impossible with fatiguing foot pedal operation and the fear of the hazards involved.

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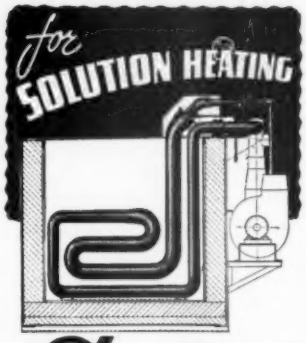
ties and reasons out each step and the measures necessary to overcome them, he does not lose himself in his work; but stands above it, working with a light hand. Such men, in action, are a joy to behold. They are artists of a high order and the writer is in daily contact with one: a machinist.

At first sight, he gives the impression of regarding his machine and the job with ill-concealed disdain. Physically, he is incorrigibly lazy; mentally, he is an erupting volcano. To look at his immense bulk and placid face, one would never associate him with speedy production, yet the difficult job and the urgent breakdown always find their way to him. Under the cloak of complete indifference, ideas flow in bewildering profusion like lava pouring down a mountain side, and no physical exertion that can be avoided is ever contemplated by him.

In order that the company share the fruits of this "lazy" man's talents, his foreman sees to it that he is fully employed on problem jobs and rush work. On the difficult job calling for intelligent thinking and careful planning he leaves all others standing. It is a simple matter getting the best out of that particular type, and physical laziness is not a sin in his case.

The man who is disinclined to physical and mental exertion but who is capable of both if led to it, requires different handling. He is usually a promising subject and will, with a little study and intelligent treatment, give good production. The great point in his case is to get his interest aroused. His type possesses the "tools," but needs to be gently pushed into making use of them. He "has it in him," but intelligent handling is required. One method, for which the writer can vouch, is for the chief foreman to arrange, through an assistant, for the man to be given a run of work requiring the minimum of skill. After a reasonable interval, the chief will casually remark to the man that he feels such work could be done by others and that something more important and more exacting must be arranged for him. Done in a casual manner, without fuss and without making the action of the chief seem to censure his assistant, this method has been successfully employed by the writer. The degree of flattery used is important. It is a variable, and careful thought must be given to that point.

The most difficult subject is the unprincipled, physically and mentally lazy type. There is no come-



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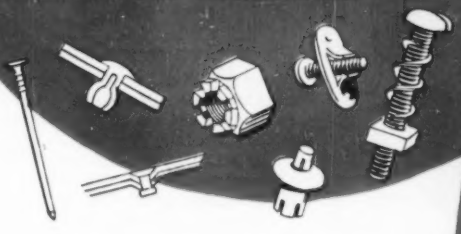

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back in him. He desires neither to work nor think constructively, although he may be capable of both activities. He can be classed only as a pervert who displays much ingenuity in devising ways and means of dodging the column. He works really hard, planning to escape hard work; and, short of taking down his pants, there is no effective way of managing him. Payment by results could be a cure, but he avoids piecework shops as he would a plague, and blandly explains that piecework is contrary to his principles. The big stick might be a cure if he would wait for it, but such discipline would offend his cherished principles; so, at the first hint of it, he moves on. So far as the company is concerned, the real cure is the boot; better an empty house than a bad tenant.

C. D. Mackinnon
Airdrie, Scotland.

•

"WHAT'S NEXT" BOARD

It appears that Ed is somewhat behind the times. Many forms of production control are in use today; and if they are fair, they are now generally accepted by most men. Management is certainly always in favor of increasing production, too.

But aside from Ed's psychological objections, there are some definite advantages and also some disadvantages to Al's new board. The board system removes much of the flexibility that exists when the foreman hands the work to the next capable worker that becomes available. What happens to a rush job if the assigned operator is absent the next day, or if his machine breaks down? Perhaps Al may get sudden rush jobs, which would mean changing the board frequently. At the Hyster Company in Portland we used a similar system, and lined up several succeeding jobs for each machine. This system assumed that all operators of a certain type of machine were equally competent. But here, too, the scheduler had to change his job lineup frequently, for rush or special orders, as well as machine and tool breakage, were constantly disrupting the existing schedule.

The advantages of a "What's Next" board would be that the operator can start thinking about his next job while he is finishing his previous one. Also, he may utilize some tools from his previous setup. At the Hyster Company we went so far as to furnish the operator with a complete set of newly ground cutting tools and special jigs or fixtures before the old job was finished, to keep

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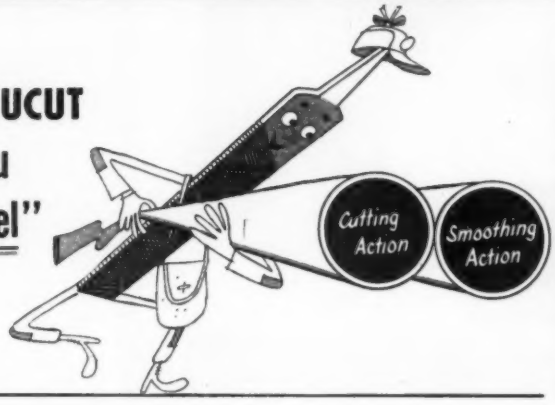

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machine downtime to a minimum. The man's steady working rhythm is not as likely to be interrupted as it would be if he had to chase up his own tools; so, in addition to less machine downtime, the operator's hourly output may be up. Still more time would be saved if the machinist doesn't have to hunt up his boss after each job, for the foreman may not always be immediately available. This delay wouldn't happen if Al had his board functioning smoothly.

In all, there are definite advantages to Al's system, if breakdowns and other hitches can be kept to a minimum.

Alfred O. Bell
Sacramento, Calif.

•

Several years ago, a well-organized and going concern had a discussion about the idea of putting up one or more boards of about the same nature, as is mentioned, in departments where the manufacturing was being done.

Some of the arguments, pro and con, were about in line with the following:

When orders came in, the men could learn that there was steady work for a period of time to come. It was well enough to have boards which would show the amount of work ahead, but, how about the times when there might be nothing on the boards?

This latter occurrence would cause the men to slow down in order to make their jobs last.

Another firm, making a regular line of product such as large machine tools, posted such boards regularly.

Theirs was a very good line; but, after some years, they began taking contracts for jobbing work.

They posted jobs ahead, on their boards, so all could see what was cooking and the variety of jobbing work was quite amazing; in fact, many of the regular production men asked to be put on outside job work, for this work generally paid better; they had more variety of operations, and the working conditions on each job were different.

The men on the jobbing work were always optimistic about it and they put lots of zest into the tasks.

Every morning, the men looked at the boards in order to be sure as to what line of work they were to take up or continue on for the day, and this saved much time and oral discussion.

Another feature about this arrangement of regular and job work allowed a change of men from one

A few of thousands of Turchan-turned jobs show the wide variety of work handled.

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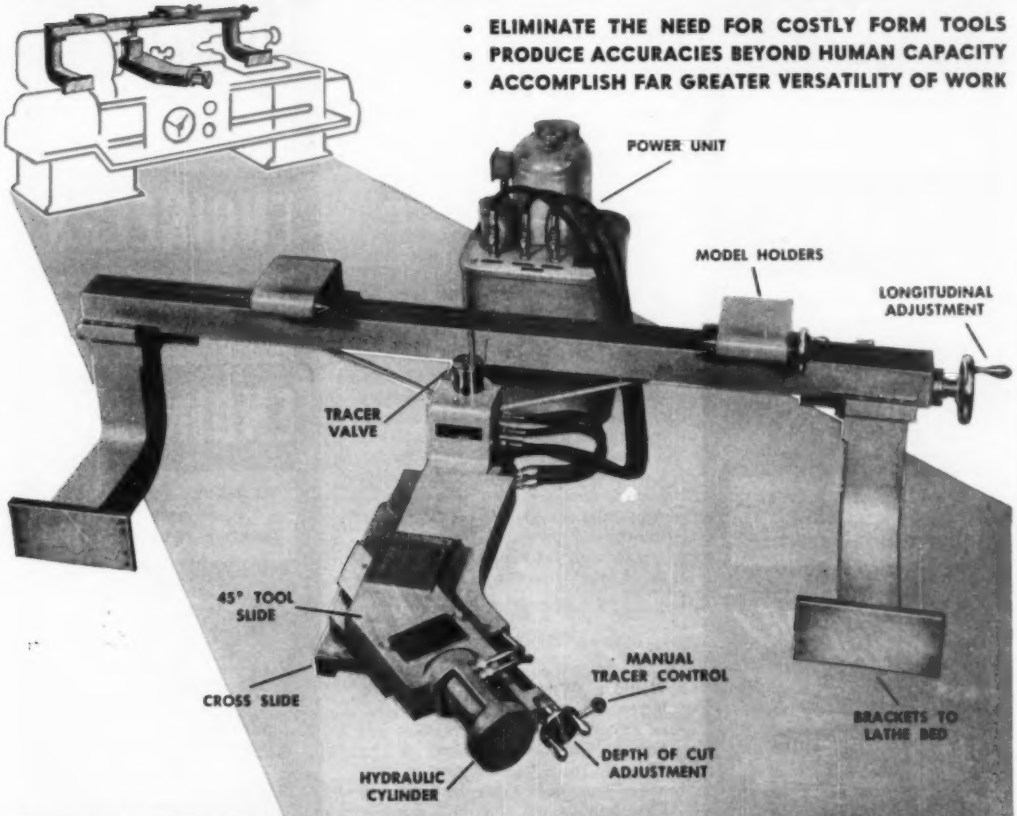

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WRITE FOR CATALOG

line to the other; hence, if production was in great demand, jobbing men could be called in and placed in the assembly line to good advantage. As was soon apparent, the job men did more work while putting a machine together, because on outside work they had been on their own and they often developed new and better ways of doing things.

For instance, a tramp mechanic taught the men many ways of doing operations easier.

When he needed a gage for a job which might never be required again, he would take a small stick, usually about ½ in. square, cut it about ¼ in. short, drive a pin in each end, and adjust them in or out until he had the proper overall length and the gage was finished to accurate measurement. It was cheap, yet good. It could be saved or discarded.

Other men on the job made other gadgets to suit the conditions; hence, it is easily seen that the men became more ingenious.

Boards of these types can be used to post safety bulletins on a part of them and they can be of great service, for if the work is to be divided into operations and these are designated to be done on certain machines, a more regular schedule can be followed to the advantage of all concerned, for each man who operates a machine can plan to sandwich jobs in between others.

Yes, such boards can be made to be of great value.

F. H. Stebbins
Worcester, N. Y.

•

Would a "What Next's" board help in the average shop? Surely it would, in any shop, although, perhaps not for the purpose envisaged in the "Round Table." A workman surmises long before the last job has been handed out that "his number is up," and a "what's next" board would neither frighten nor reassure. Its value lies in the real service it can perform, sometimes to all grades. To know beforehand what's the next job is a real timesaver, and it enables a man to see his next job; to think about it, and sometimes to prepare for it, so that when the job-in-hand is finished, he can make a flying start with the next.

The writer met the idea nearly forty years ago and would mention two different methods; one run by the shop, another by the Progress Dept. In one, "times on" and "times off" were recorded by clocked stampings. The job cards were carried in vertical racks at the side of the clock,

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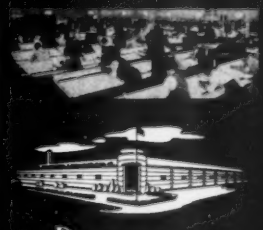

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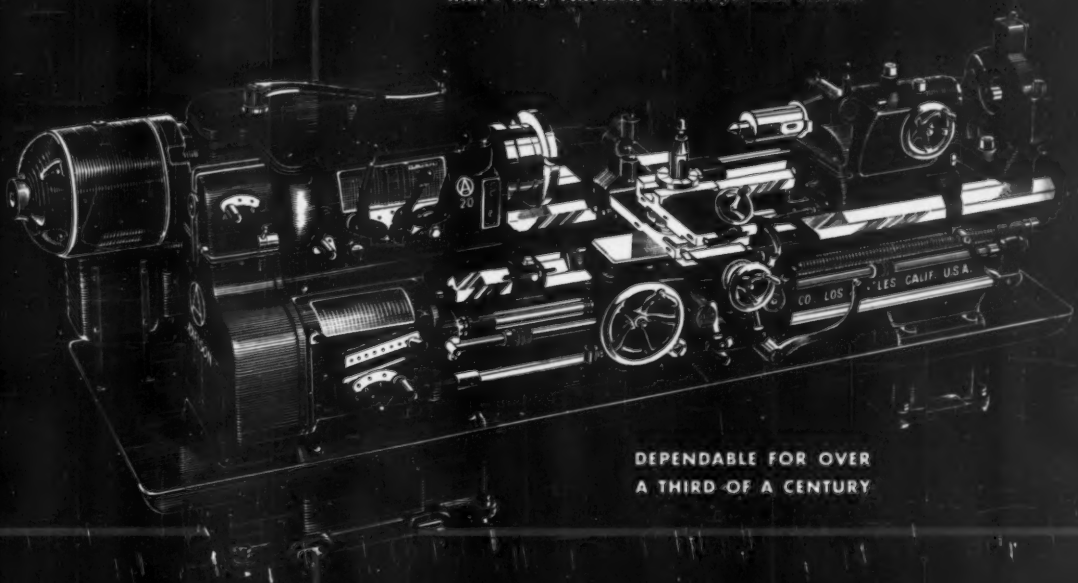

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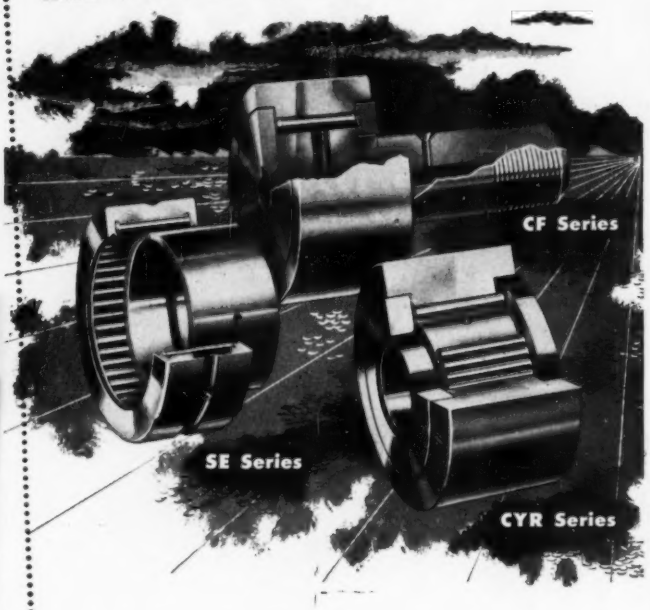

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a pocket for each man under the headings—"Next Job," "Job on Hand," "Job Finished." The system worked well and "the clock" became the center of information for all grades of staff, including timekeepers.

In another works, all arrangements were made by the Progress Department. Every machine was planned for a week ahead, or more, and the planning could be consulted by one and all. No job was planned until all tools and fixings required were available, itself a timesaver. The details of these planned jobs were clipped to wooden strips mounted on side links in a kind of roller towel or roller shutter arrangement. This enabled any strip—there being one for each machine—to be brought within view at will, leaving the manning of the machines entirely to the foreman. The Progress Department requisitioned all material and supplied the job card to the man, a real relief to the foreman. All material, raw and in-progress, was passed through the "work depot," which was controlled by the Progress Department. This system also worked well, and the boss was not thought to be guilty of any ulterior motive. Rather, to the shops, it was not unlike a railway timetable, giving the planned times of departure and arrival of trains.

P. E. James
Lindum, England

•

PACK RATS

The problem of employees removing plant property has faced industry and business ever since the start of time. It seems that no matter how well off some people are, there is that inherent attitude of "what is yours is mine," and what is mine is my own. Most people would be highly insulted if they were accused of stealing.

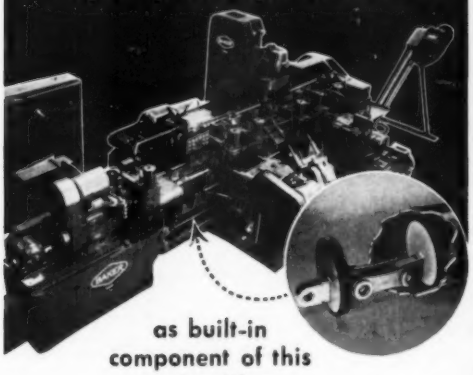
Why is this? Perhaps it is the desire to have things, or maybe just the longing to get something for nothing. Truly, this last reason can account for the way in which people are drawn to schemes to get rich quick or the lure of not working but attaining a high plane of living. So it is with the pack rat. He feels that the little item he took home last week was only scrap, and he could use it to his own advantage. After all, the company would never miss it. Probably a true statement. Many companies do not realize that they are being relieved of many things that raise the cost of operation sometimes as much as 50%.

In some plants this has reached

Hapman

TUBULAR CHIP CONVEYOR

helps speed production



as built-in component of this cost-cutting

BAKER MULTI-OPERATION MACHINE

With built-in Hapman Tubular Conveyors, alert machine tool designers are getting faster chip removal, allowing faster operating speeds and greater production.

Take this Baker Multi-operation transfer-type Machine, for example. Hapman rubber-flighted sealed-pin Chain Conveyors carry off chips resulting from five distinct operations. On other applications, Hapman Conveyors carry grinding sludge, iron, steel and aluminum chips, welding flux, and dozens of other abrasive and corrosive materials.

Investigate Hapman advantages — as related to equipment *you* build or buy. It may pay you big dividends in speed and efficiency. Hapman Conveyors are working for many of America's largest firms . . . a proof of practical, dependable performance. Write for details.

Write for your copy of Hapman Catalog AM-651 for details and applications

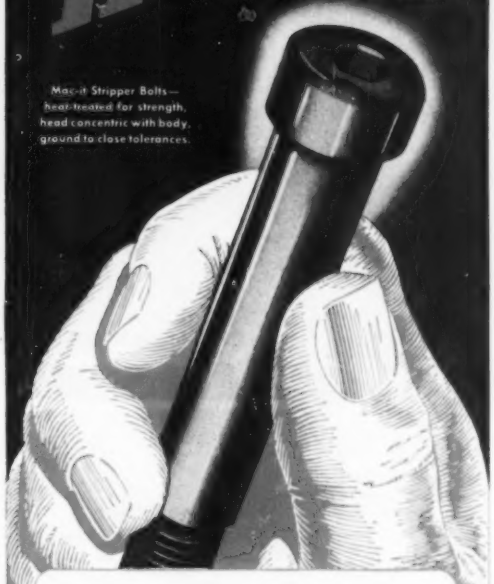
Hapman CONVEYORS, INC.

DIVISION HAPMAN DUTTON COMPANY

KALAMAZOO MICHIGAN

IT'S A Mac-it ®

PRONOUNCED "MACK-IT"



BETTER, FASTER SERVICE WITH THIS *COMPLETE* MAC-IT LINE!

Because many standard types of Mac-its are stocked throughout the country for quick delivery, and because specials can be engineered to your own specifications, you'll find it pays to investigate Mac-its *first.*

Mac-it's 38 years' experience in the manufacture of heat-treated, alloy steel screws is your assurance of precision, uniformity and strength. Sold through leading industrial distributors from coast to coast and in Canada. Write for new catalog today!

Other Mac-it products include:

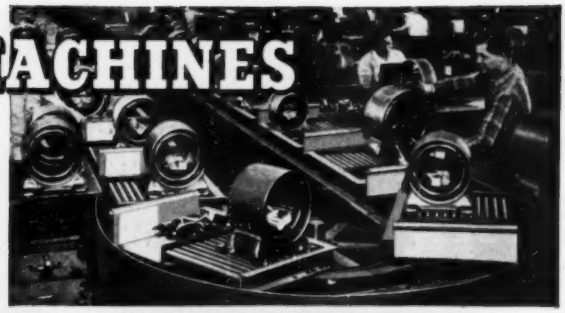
- Hollow Lock Screws
- Socket Head Cap Screws
- Hollow Set Screws
- Hollow Pipe Plugs
- Socket Screw Keys
- Square Head Set Screws
- Hexagon Head Cap Screws
- . . . and many others

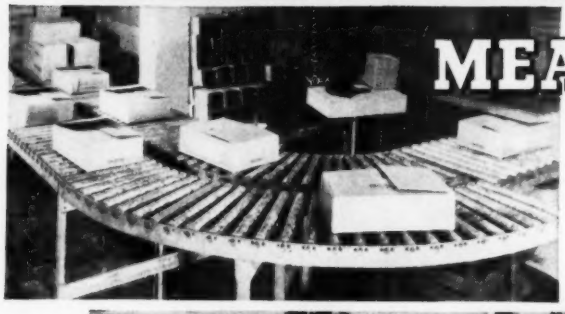
Marketed Nationally Since 1913 by

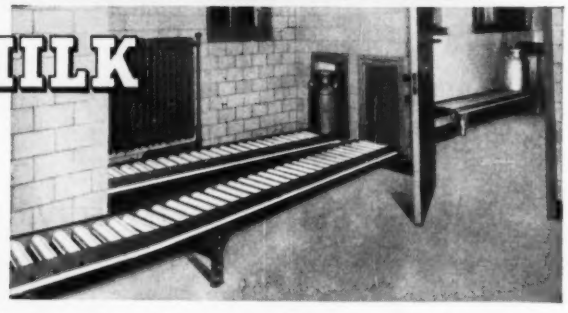
STRONG, CARLISLE & HAMMOND COMPANY

Cleveland 13, Ohio

Manufactured by MAC-IT PARTS COMPANY, Lancaster, Pa.







Handling costs cut—operations speeded up—in these and many other businesses and industries.

Standard Conveyor is recognized as "conveyor headquarters" by many nationally known companies, making or handling commodities or products as diverse as machines — meat — milk.

Wherever packages, parts, units or containers have to be handled, there is a type of Standard Conveyor — gravity or power, roller, belt, slat, push-bar, wheel — a portable unit — available to do each particular handling job best. Write —

Write to Dept. AM-61 valuable reference book "Conveyors by Standard" and tell us what you want to convey.

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul, Minnesota
Sales and Service in Principal Cities

ROLLER • BELT • SLAT • CHAIN • WHEEL
PUSH-BAR • SECTIONAL
PORTABLE CONVEYOR UNITS:
HANDIBELT • HANDIPILER
INCLINEBELT • LEVEL BELT • EXTENDOVEYOR
UTILITY BELT-VEYOR • HANDI-DRIVE
VERTICAL LIFTS • PNEUMATIC TUBE SYSTEMS

serious proportions, and drastic steps have been taken to try to stop the loss. One company makes all employees change clothes in a carefully guarded locker room, and all employees are then searched before being allowed to leave the room. Yet literally thousands of dollars' worth of critical materials get through this fine screen. One wonders if this is at all the way to combat it.

Another company has established a pass gate, and no metal can be carried on the person without its being detected. This, however, did not stop the loss of 2 pickaxes and 25 shovels that must have been smuggled out somehow. Over the fence, you say? Perhaps; but it would seem rather a hard way to get something for nothing. The plant was enclosed by a 20-ft fence, and had a river on two sides. The other two sides were carefully guarded. No matter how they got out, they certainly did, and the loss was considerable, for things of this nature could not be replaced easily at the time.

Yes, one wonders about such things and whether it can be controlled. Still, the removal of little items like pens, pencils, erasers and odd scrap will go on. What, then, is the solution? Here is one that is not a complete cure, but certainly does help to reduce the amount of loss.

Set up a salvage-department disposal plan. Let the employees obtain this material for a small fee, or give it away based on some method of distribution such as a drawing of numbers by those desiring the material. Then establish a department where your employees can pur-

"I see they're getting ready to select a new foreman!"

FLEXLOC®

SELF-LOCKING NUTS

STAY

TIGHT

AFTER

171,360,000

VIBRATIONS AT 4000 CYCLES PER MINUTE...

Plain nuts with lock washers loosened after only ONE HOUR of 4000-cycle-per-minute operation on the vibrator of a concrete block machine at the plant of the Bethayres Concrete Block Co., Bethayres, Pa.

When FLEXLOC Self-Locking Nuts were installed, they were *still tight* when the machine was torn down for rebuilding after 6 weeks operation—at 4000 C.P.M., 17 hours a day, 7 days a week!

If you have an application where nuts loosen or back off, try FLEXLOC, the one-piece, all-metal STOP- and LOCK-NUT "that won't work loose."

Send for Bulletin 619-A today.

-SPS-

STANDARD PRESSED STEEL CO.

JENKINTOWN 1, PENNSYLVANIA

CHECK THESE FEATURES:

- **BURR FREE EDGE** no finishing operation necessary
- **EASY TO OPERATE** no starting hole necessary
- **48" THROAT**
- **DOES BEADING AND FORMING**
- **CUTS 10 TO 36 FEET PER MINUTE**
- **ONLY 5 MOVING PARTS**
- **CAPACITY: 6 GAUGE IN MILD STEEL 7 GAUGE IN STAINLESS STEEL**
- **DELIVERY FROM STOCK**
- **COST? . . . $1960.00 F.O.B. TOLEDO**

In actual cases on record, the Baker Tru-Edge Contour Shear cuts operating time to less than 1/10 of the time required on previous machines.

BAKER BROS., Inc. Toledo, Ohio

MAKERS OF BETTER MACHINE TOOLS . . . SINCE 1867

The Tru-Edge Contour Shear is made by Baker Bros., Inc., under license from Industrial Devices Corp., Detroit, Mich.

From the *American Machinist* Library of *Tips for Top Shop Men*

DON'T underestimate the effect of an unsound sales budget on production efficiency. Inaccurate forecasts mean fluctuating schedules, a changing work force, and low worker morale.

ARE you lugging materials to and from a machine for a minor operation that should be done where the material is? Check facing to length, centering, cut off, plain grinding. If volume is large, it may be cheaper to move the machine once and for all rather than moving the material continuously.

Give them the tools... they'll do the job!

• Converting from ordinary hand wrenches to a Buckeye air wrench on just two assembly operations has meant a 20% increase in assembly line output for Lambert Products, Inc. These jobs are handled solely by women, using a lightweight, easy-to-handle Buckeye air wrench.

Equally important to this nationally-known manufacturer of hand and power mowers is the fact that employees are far less fatigued, do more and better work in less time, at lower cost.

The right kind of Buckeye Tools may help solve many of your manpower, production and assembly line problems. Since there's no obligation, wouldn't it be wise to have our representative give you all the helpful facts? His name, and our catalog will be sent on request.

Buckeye Tools CORPORATION
DIVISION 15 • DAYTON 1, OHIO

Portable Air and Electric Tools for Industry

IN CANADA: Joy Manufacturing Co. (Canada) Ltd., Galt, Ontario

chase small items at wholesale prices or slightly above. Make it easy for them to get what they want. Many of them will stop taking home company property. Not all of them will, for, as we stated earlier, some people believe in the policy that what is the company's is theirs and "I intend to have it . . . providing I don't get caught."

The most successful way for a long-term plan is to start to make your employees realize that they are not "helping themselves" but that they are actually hurting the chances of the company for which they work. This is not a "cinch" to put across, and most companies think the plan too much work to operate. Therefore we continue to have pack rats and probably always shall.

Charles D. Townsend
West Hartford, Conn.

•

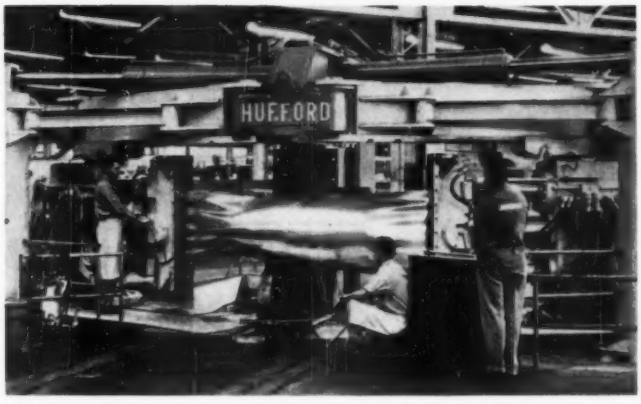
Hurrah, Ed! What's the use of being so persnickety about a bit of material; trying to account for every ounce or quarter of an inch, not to mention the cost and trouble of so doing. Requisitions, storekeepers, clerks, records of receipts, issues, and the amounts left in stock. That's the way overheads are run up. Oh, the money that could be saved if all this bunkum were cut out. Besides, does not the Old Book say the ox should not be muzzled when treading out the corn.

Further, there are men, and good men at that, who are model makers; who repair their own cars, bicycles, and the household mangle, etc. These all require material, not much for any one job—at any rate, not at the moment—but if the Boss is going to insist that every piece, however small, must be accounted for; such a decision would constitute a real hardship, because small quantities are proverbially expensive. Really, seeing that the firm will have all the machine tools for doing the work, they might be asked to let them be used, power and all, for doing these odd jobs, thus providing a complete unit. They might even go further, and allow the men to make up their own wages and appropriate the respective amount from the safe. Then, surely, everything in the garden would be lovely, and life could be a pleasant dream. But it may be advisable, before the door is opened too far, to consider the matter in retrospect.

The business of a firm will be to make engines, mangles, gages, or bolts; and these must be made to a price and within some prescribed

Continued on p. 204

subcontracting NEWS



FORMING B-47 TAIL CONE SECTION on the Hufford Sheet Stretch Press installed at Wichita Div., Boeing Airplane Co., where world's fastest jet bomber is in quantity production for U. S. Air Force. The 75-ton press, with a capacity of 150 tons, stretches and forms sheet metal into fuselage skin in practically one operation, handling stock up to 66-in. wide

2000 Suppliers Needed for Chrysler's Defense Projects

DETROIT—Chrysler Corp. is lining up an additional 2000 suppliers as further progress is made on the company's defense projects. More than 1200 individual companies from all sections of the country have already been enlisted by Chrysler to assist in defense assignments now on its books.

In its current defense and civilan production, Chrysler draws supplies from 8500 companies in 1247 cities and towns, 41 states and 4 foreign nations.

Eighty-eight percent of Chrysler's current suppliers fall in the small business category of concerns employing less than 500 persons.

Production at the Chrysler Tank Plant now under construction at Newark, Del., will require services of about 1000 companies for the necessary manufacturing equipment and production materials and parts. The Chrysler New Orleans plant being readied for tank engine production will also need about 1000 suppliers. One of Chrysler's relatively smaller assignments, the production of range finders in an extension being built at its Dayton Airtemp plant, will produce work for about 350 suppliers.

No estimates are yet available on the number of suppliers sought for the company's assignment to build hulls for the Grumman Albatross amphibious rescue plane in its Plymouth plant at Evansville, Ind.

Largest category of subcontracted work, according to Joseph Pfeiffer, director of purchases, consists of specialized parts that require peculiar facilities and skills, such as electronic and electrical equipment, plastic parts, rubber parts, bearings, ferrous and non-ferrous castings, and standard parts.

Role of Small Business Stressed

WASHINGTON — The Munitions Board has announced an increase in dollar value of contracts awarded small business. For the quarter ending March 31, 1951, a climb from 16.6% in Jan. to 25.9% in March is shown. Subcontracting adds a bigger volume to these figures.

Temco Builds Plane Sections

DALLAS, Tex.—Texas Engineering & Mfg. Co., Inc., will build major assemblies for Glenn L. Martin Co.'s P5M-1 Marlin flying boat, a Navy patrol bomber. Martin is the third major military manufacturer to select Temco as a major subcontractor. Previously Temco was awarded a contract by Boeing to build rear fuselage sections for the B-47 stratojet, and by Lockheed to build outer wings for the P2V Neptune.

Goodyear Reactivates Plant

AKRON, Ohio — Goodyear Tire & Rubber Co. is returning to one of its World War II roles as a producer of propellant charges for big guns of the armed forces. The company will begin rehabilitation of and later will operate the big Hoosier Unit of Indiana Arsenal at Charlestown, Ind.

Where to Get Buying Information

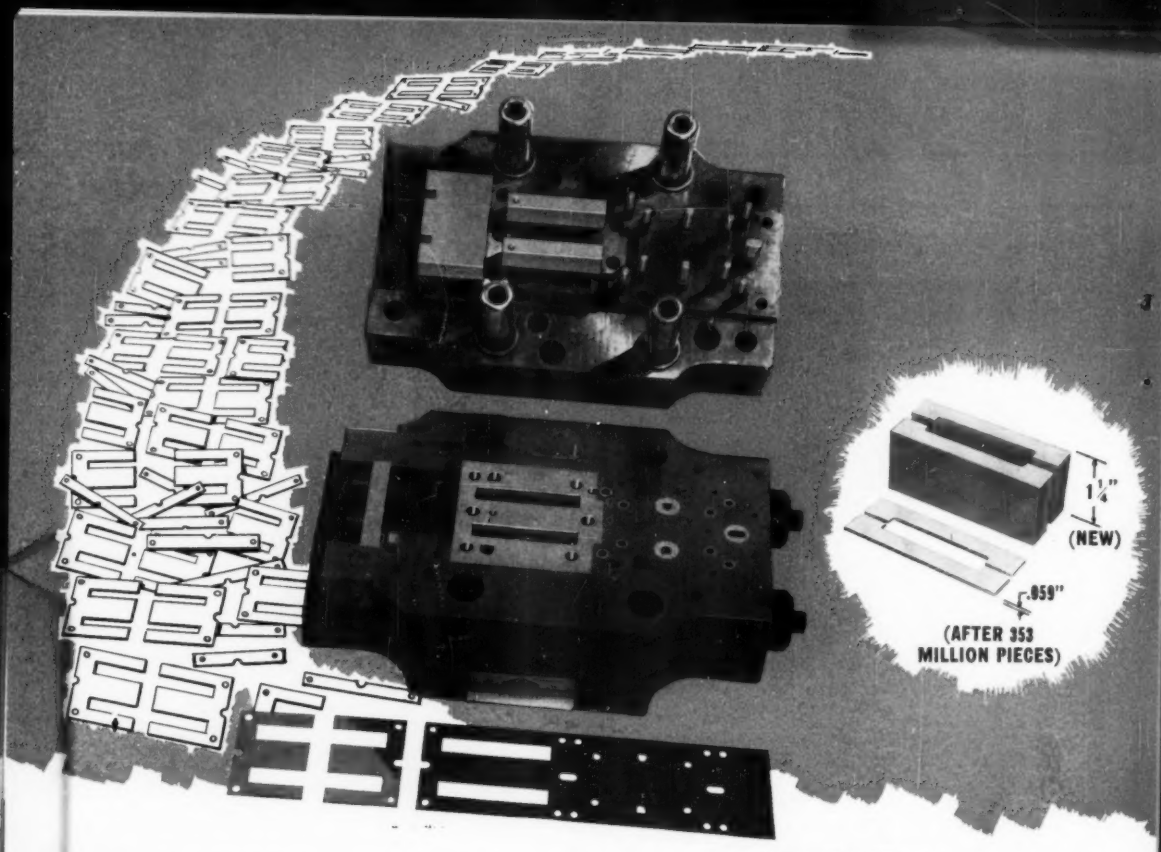
WASHINGTON — The Army Procurement Information Center and the Central Military Procurement Information Office, Munitions Board, Department of Defense, has been moved to downtown Washington for the convenience of visiting businessmen. Neither of these offices does any purchasing. The new address, 334 Old Post Office Bldg., 12th & Pennsylvania Ave., N. W.

Tooling Under Way at Willys

TOLEDO, Ohio — Willys-Overland Motors, Inc., has signed a facilities contract to begin a multi - million - dollar tooling program in its Toledo plant for production of landing gears for the Air Force's C-119 cargo plane. The company has received an initial contract for production of the landing gear assemblies. First phase of this production will exceed $3 million in value.

Negotiations are under way also for a $2 million tooling program at the Wilson Foundry & Machine Co., a wholly owned Willys subsidiary at Pontiac, Mich., for production of shell cartridge cases.

Plans include installation of 350 heavy-duty machine tools to machine the landing gear components. The company will expand its facilities for forging components for these assemblies.



MILLIONS & MILLIONS *MORE* PIECES

. . . to controlled burr limits with **Diecarb**

Press—Henry & Wright Dieing Machine operating at 300 strokes per minute, 4 blanks per stroke (2 "E" sections, 2 "I" sections.)

	Steel Die Sections	Diecarb Sections
Pieces per grind (av.) . . .	300,000	2,800,000
Pieces per life of die . . .	20,000,000	353,024,000

Production efficiency increased 50% due to reduced downtime.

Die costs Performance Ratio—1400% production increase with Diecarb Die and only 82% die cost increase; producing flatter, strain free blanks with less burr.

Blanking .014 and .025 silicon steel transformer core laminations is a tough assignment for any die . . . except the die equipped with Diecarb sections. Performance comparisons prove conclusively the wisdom and economy of specifying Diecarb for blanking, stamping, and perforating operations.

Firth Sterling's Diecarb Engineers will work cooperatively with your tool designers and diemakers in equipping your dies with Diecarb for maximum performance.

Write or phone your nearest Firth Sterling Office for more particulars about Diecarb.

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STEEL & CARBIDE CORPORATION
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R-233

LATEST DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Tank-Automotive Center, Detroit

Gramm Trailer Corp., Lima, Ohio—semi-trailer, 6 ton.

Diamond T Motor Car Co., Chicago—differentials, transmissions.

C. A. Strelinger Co., Detroit—engine lathe, drill presses.

Triplex Corp., Pueblo, Colo.—engine pistons.

Action Mfg. Co., Philadelphia—clutch, turret.

Rollway Bearing Co., Syracuse, N. Y.—roller bearings.

Northern Machine & Steel Co., Cadillac, Mich.—lever, track suspension.

American Generator & Armature Co., Chicago—engine armatures.

Bayley Products, Inc., Detroit—seat assemblies.

Buffalo Forge Co., Buffalo, N. Y.—drill press.

Willys-Overland Motors, Inc., Toledo—engine & accessories.

Oilgear Co., Milwaukee, Wis.—hydraulic pumps.

Highway Trailer Co., Edgerton, Wis.—semi-trailer, 12-ton.

Autocar Co., Ardmore, Pa.—suspension pins.

Conlon Electric Corp., Brooklyn, N. Y.—harness kit, wiring.

Clark Cable Corp., Cleveland—engine harness.

Leonard Keller Products, Ferndale, Mich.—maintenance kits.

Ford Motor Co., Washington, D. C.—pick-up trucks.

Cincinnati Lathe and Tool Co., Cincinnati, Ohio—engine lathes.

Anderson Bros. Mfg. & Eng. Co., Detroit—drive shafts.

Spencer Thermostat Div., Attleboro, Mass.—circuit breakers.

Weatherhead Co., Cleveland, Ohio—hose connectors.

Manbee Equipment Div., Bear Mfg. Co., Rock Island, Ill.—wheel balancer.

Boice Crane Co., Toledo, Ohio—drill presses.

Miller Trailers, Inc., Brandentown, Fla.—semitrailer, stake & platform, 12 ton.

Pneu-Hydro Div., F. J. McCarthy, Inc., Cadillac, Mich.—suspension, horizontal assembly, front center.

Diebold Inc., Detroit—arm, track.

Budd Co., Detroit—hub and drum, with cups and studs, assembly.

Truck & Coach Div., General Motors Corp., Pontiac, Mich.—bus body on chassis; shaft, front axle, left assembly.

Packard Electric Div., General Motors Corp., Warren, Ohio—box, cable assembly.

International Harvester Co., Washington, D. C.—truck, tank, 5-ton, 4x2, 1600 gal.

Hercules Motors Corp. Canton, Ohio—engine, with accessories.

Allis-Chalmers Mfg. Co., Milwaukee—differential, assembly control; springs & parts.

Dana Corp., Toledo—shaft prop with universal joints; shaft propeller.

Champion Spark Plug Co., Toledo—spark plug, 14mm, aircraft, type shielded.

National Farm Machinery Cooperative, Inc., Shelbyville, Ind.—bench, cabinet.

Indianapolis Stove Co., Inc., Indianapolis—bench, cabinet.

Triplex Corp. of America, Pueblo, Colo.—piston and pin assembly; piston, engine.

Wayne Aluminum Foundry & Machine Co., Wayne, Mich.—kit, repair bushing ring box; block terminal spring contact brush; receptacle, signal circuit; and misc. brush with terminals.

Milwaukee Gear Co., Milwaukee—pinion, set differential compensating.

Federal Motor Truck Co., Detroit—shaft, propeller, with universal joint assembly.

Ward LaFrance Truck Corp., Elmira, N. Y.—lever, throttle control, spindle drive, bolt, engine crankshafts; differentials.

Chevrolet Motors Div., General Motors Corp., Detroit—trucks, pickup, 1 ton 4x2; trucks, panel, 1 ton, 4x2; automobile sedans.

White Motor Co., Cleveland—truck tractor, 5 ton, 4x2,; truck, dump, 5 ton, 4x2.

Rogers Bros., Albion, Pa.—trailer 45 ton; spare parts.

Diamond T Motor Car Co., Chicago—rod, rear axle, upper assembly.

Smith Welding Equipment Corp., Minneapolis—regulator, acetylene pressure; regulator, oxygen pressure.

Frankford Arsenal, Philadelphia

Electronic Tube Corp., Philadelphia—amplifier assembly.

Armco Steel Corp., Middletown, Ohio—case disks.

Philadelphia Board of Education, Philadelphia—machine tools.

Edmond Scientific Corp., Barrington, N. J.—blanks, lens.

Alliance Mfg. Co., Alliance, Ohio—instrument lights.

Murray Ohio Mfg. Co., Cleveland—cartridge cases.

Ordnance Gage Co., Philadelphia—Brown & Sharpe No. 3 special milling.

The Oliver Corp., Battle Creek, Mich.—shell assemblies.

Jones & Lamson Mfg. Co., Springfield, Vt.—grinding machines.

Advance Pressure Castings, Inc., Brooklyn—die castings, special tooling.

Lyman Gun Sight Corp., Middlefield, Conn.—Alaskan telescope.

Rudolph Wendle, Inc., New York—spare parts, telescope.

Precision Drawn Steel Co., Camden, N. J.—cartridge cases.

Scovill Mfg. Co., Waterbury, Conn.—cartridge cups.

Leopold Stevens Instrument Corp., Portland, Oregon—telescopes.

Action Mfg. Co., Philadelphia—reticle cells.

Winchester Repeating Arms, New Haven, Conn.—cartridges, ball; non-corrosive primers.

Springfield Ordnance District

Scovill Mfg. Co., Waterbury, Conn.—metal parts assembly.

Hart Mfg. Co., Hartford, Conn.—bullet drives.

Package Machinery Co., East Long Meadow, Mass.—linking machines.

Royal Typewriter Co., Hartford, Conn.—automatic cal. .30 rifles.

New Britain Machine Co., New Britain, Conn.—cartridge lathes.

New York Ordnance District

Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—automotive supplies.

Mergenthaler Linotype Co., Brooklyn—production tooling.

Detroit Ordnance District

Grand Rapids Hardware Co., Grand Rapids, Mich.—boosters & facilities.

American Seating Co., Grand Rapids, Mich.—automotive service parts.

Continental Motors Corp., Muskegon, Mich.—automotive parts.

Gerity-Mich. Corp., Adrian, Mich.—facilities for chrome plating.

Continental Aviation & Engr. Corp., Detroit—automotive spare parts.

Ceco Gauge & Tool Co., Detroit—Kopee helical spline grinder with attachments.

Watervliet Arsenal

Midvale Co., Nicetown, Pa.—forgings.

Lyon Metal Products, Inc., Aurora, Ill.—steel shelving units.

Harold B. Ketcham & Son, Belchertown,—cannon parts.

Muncie Gear Works, Muncie, Ind.—cannon parts.

Redco Tool Div., Red Lion Cabinet Co., Red Lion, Pa.—cannon parts.

Eclipse Sleep Products, Inc., Brooklyn, N. Y.—cannon parts.

SIGNAL CORPS AWARDS

SC Procurement Agency, Philadelphia

Accurate Insulated Wire Corp., New Haven, Conn.—equipment required to produce field wire.

Raytheon Mfg. Co., Newton, Mass.—expansion of facilities and equipment for production of subminiature tubes.

Circle Wire & Cable Corp., Maspeth, N.Y.—expansion of facilities for production of field wire.

J. H. Holan Corp., Cleveland—truck, V-17.

Pioneer Gen-E-Motor Corp., Chicago—dynamotor.

Amperex Electronic Corp., Brooklyn, N. Y.—hydrogen thyratrons.

Stanley Knight Corp., Chicago—tool kit.

Radiomarine Corp. of America, New York—radar set.

American Television, Inc., Chicago—hydrogen thyratrons.

Specialty Assembling & Packing Co., Inc., Brooklyn, N. Y.—tool equipment.

International Spare Parts Corp., Long Island City, N. Y.—spare parts for internal combustion engines.

Century Tool Co., Palmyra, N. J.—tool equipment.

Automatic Electric Sales Corp., Chicago—teletypewriter switching center.

Wallace & Tiernan Products, Inc., Belleville, N. J.—hygrometer, dew point.

Helene Curtis Industries, Inc., Chicago—teletypewriter message projector.

Lavoie Laboratories, Morganville, N. J.—oscillograph, cathode ray.

Tektronix, Inc., Portland, Ore.—oscilloscopes.

Electro Engineering & Mfg. Co., Detroit—radio receiving set.

ARMY ENGINEERS AWARDS

Corps of Engineers, Chicago Procurement Office

Hobbs Mfg. Co., Fort Worth, Texas—trailers.

R. G. LeTourneau, Inc., Peoria, Ill.—scrapers.

Brooks Eqpt. & Mfg. Co., Knoxville, Tenn.—hoisting units.

Littleford Bros., Inc., Cincinnati—pumps, asphalt trailer.

Rosco Mfg. Co., Minneapolis, Minn.—pumps, asphalt trailer.

Davey Compressor Co., Kent, Ohio—air compressor, trailer.

Standard Oil Co. of California, San Francisco—pressure dischargers.

R. Cooper Jr., Inc., Chicago—rigging equipment.

Warner Electric Brake & Clutch Co., Chicago—spare parts.

Timken Roller Bearing Co., Canton, Ohio—spare parts.

Tyson Bearing Co., Massillon, Ohio—spare parts.

Caterpillar Tractor Co., Peoria, Ill.—spare parts.

Baldwin-Lima-Hamilton Corp., Lima, Ohio—spare parts.

Koehring Co., Milwaukee, Wis.—spare parts.

Rogers Bros. Corp., Albion, Pa.—trailers.

Allis-Chalmers Mfg. Co., Milwaukee—tractors.

Worthington Mower Co., Stroudsburg, Pa.—tractors.

Buda Co., Harvey, Ill.—earth augers and attachments.

Mercer Eng. Co., New York—crane, industrial, type "A" kits.

(Continued on page 197)

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2 STRATEGIC PLANTS
in York, Pa., and Aurora, Ill., with a combined manufacturing capacity of 600,000 square feet—1600 employees.

EXPERIENCE
gained in handling 3800 subcontracts during World War II—for Army, Navy, Aircraft and Ordnance requirements.

OUR OWN TOOL ROOMS
with complete facilities to expedite the production of special tools, dies, jigs and fixtures at both York and Aurora plants.

SPECIAL PRODUCTS COMMITTEE
analyzes every special contract—determines how to do the job most economically—in the shortest possible time.

2 STRATEGIC PLANTS . . . AURORA, ILL., AND YORK, PA.

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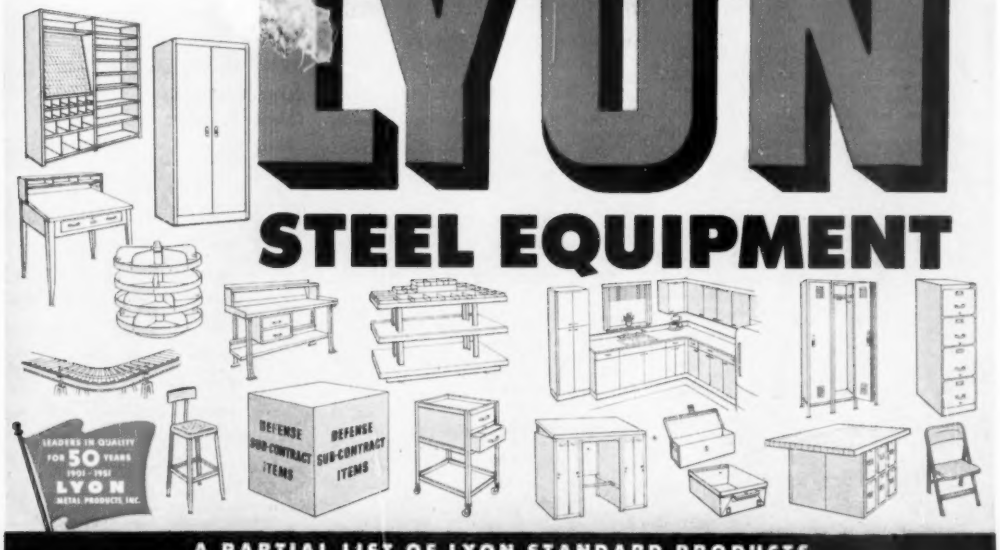
LYON METAL PRODUCTS, INCORPORATED
General Offices: 689 Monroe Avenue, Aurora, Illinois

LYON STEEL EQUIPMENT


LEADERS IN QUALITY FOR 50 YEARS 1901 - 1951 LYON METAL PRODUCTS, INC.
DEFENSE SUB-CONTRACT ITEMS
DEFENSE SUB-CONTRACT ITEMS

A PARTIAL LIST OF LYON STANDARD PRODUCTS

- Shelving
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- Stools
- Bin Units
- Kitchen Cabinets
- Cabinet Benches
- Storage Cabinets
- Welding Benches
- Conveyors
- Bar Racks
- Tool Boxes
- Parts Cases
- Economy Locker Racks
- Flat Drawer Files
- Tool Room Equipment
- Wood Working Benches
- Display Equipment
- Drawing Tables
- Revolving Bins
- Hanging Cabinets
- Filing Cabinets
- Folding Chairs
- Work Benches
- Bench Drawers
- Service Carts
- Sorting Files
- Drawer Units
- Hopper Bins
- Tool Stands
- Shop Boxes
- Tool Trays
- Shop Desks

ARMY ENGINEERS . . . continued

Eindal Mfg. Co., Albuquerque, N. M.—trailers.

International Harvester Co., Melrose Park, Ill.—tractors.

Gar Wood Industries, Wayne, Mich.—scrapers; crane, shovel, power units.

Toro Mfg. Co., Minneapolis—tractors, industrial.

M-R-S Mfg. Co., Flora, Miss.—tractors and trailers.

W. E. Grace Mfg. Co., Dallas, Tex.—sweepers, rotary.

LaCrosse Trailer Co., LaCrosse, Wis.—trailers.

Electric Wheel Co., Quincy, Ill.—trailers.

Pullman Standard Car Mfg. Co., Power Ballaster Div., Chicago—tamper, multiple, railroad mounted.

Independent Pneumatic Tool Co., Aurora, Ill.—drills, pneumatic; paving breakers.

Worthington Pump & Machine Corp., Chicago—drill, penumatic.

Nordberg Mfg. Co., Milwaukee—railroad mounted equipment.

Sight Feed Generator Co., West Alexandria, Ohio—generator, acetylene.

Galion Iron Works & Mfg. Co., Galion, Ohio—roller, road tandem type.

LeRoi Co., Cleveland—drifter, drill, pneumatic; air compressor, trailer mounted.

Tampo Mfg. Co., San Antonio, Tex.—roller, road, towed type.

Four Wheel Drive Co., Clintonville, Wis.—trucks.

Barber-Greene Co., Aurora, Ill.—paving machines, asphalt.

Littleford Bros., Inc., Cincinnati—tank, asphalt steel, trailer mounted.

Huber Mfg. Co., Marion, Ohio—roller, road motorized.

American Steel Works, Kansas City, Mo.—roller, road, towed type.

Bay City Shovel, Inc., Bay City, Mich.—crane, revolving, 6x6 truck mounted.

Jos. F. Kiesler Co., Chicago—spare parts.

Rogers Bros. Corp., Albion, Pa.—spare parts.

Linde Air Products Co., New York—spare parts.

Jeffrey Mfg. Co., Columbus, Ohio—spare parts.

Electric Auto Lite Co., Toledo—spare parts.

Bucyrus-Erie Co., South Milwaukee, Wis.

Ohio Auto Parts Co., Columbus, Ohio—spare parts.

C of E, North Atlantic Div., Philadelphia

Hunter Fan & Ventilating Co., Inc., Memphis, Tenn.—fans, oscillating.

General Detroit Corp., Detroit—fire extinguishers.

Parco Products Co., Pennsburg, Pa.—fire extinguishers.

Pittsburgh District Engineer

Franklin Mfg. Co., Providence, R. I.—bridge components.

Atlantic Hardware and Supply Corp., New York—repair equipment.

QUARTERMASTER AWARDS

Quartermaster Purchasing Div. Columbus 15, Ohio

Continental Motors, Muskegon, Mich.—spare parts, special-purpose equipment.

Ross Carrier Co., Fenton Harbor, Mich.—spare parts, materials handling equipment.

Orr and Sembower, Inc., Reading, Pa.—spare parts, special purpose equipment.

Cleaver Brooks Co., Milwaukee—spare parts, special purpose equipment.

General Radiator Co., Marion, Ill.—spare parts, materials handling equipment.

Columbus Production, Columbus—spare parts, materials handling equipment.

Clark Equipment Co., Battle Creek, Mich.—spare parts, materials handling equipment.

American Monorail, Cleveland—spare parts, materials handling equipment.

NAVY AWARDS

Bureau of Ordnance Washington 25, D. C.

A. O. Smith Corp., Milwaukee—torpedo dummies.

H. A. Sward Co., Inc., Inwood, L. I., N. Y.—demolition kit.

Elgin National Watch Co., Elgin, Ill.—machine tools.

P. R. Mallory & Co., Inc., Washington, D. C.—vibrator power supply.

Philadelphia Naval Shipyard

General Electric Co., Philadelphia—repair parts, reduction gear, repair parts, motor priming pump.

Westinghouse Electric Corp., Philadelphia—repair parts, battery vent fans.

Cutler Hammer, Inc., Philadelphia—repair parts: pump motors.

Chase Shawnut Co., Newburyport, Mass.—cartridge fuses.

Gould Pumps, Inc., Seneca Falls, N. Y.—pump parts.

Ships Parts Control Center Mechanicsburg, Pa.

General Electric Co., Philadelphia—turbine repair parts.

Electric Motors Div., GMC, LaGrange, Ill.—diesel engine repair parts.

Sperry Gyroscope Co., Div., Sperry Corp., Great Neck, L. I., N. Y.—repair parts for gyro compasses.

Cooper-Bessemer Corp., Mt. Vernon, Ohio—repair parts, diesel engines.

Reliance Electric & Eng. Co., Cleveland—electric motors and repair parts.

United States Hoffman Machinery Corp., New York—repair parts for laundry equipment.

Detroit Aluminum & Brass Corp., Detroit—bearings for diesel engines.

Arma Corp., Brooklyn, N. Y.—repair parts, gyro compasses.

Carrier Corp., Syracuse, N. Y.—repair parts, refrigeration equipment.

Star-Kimble Motor Div., Miehle Printing Press & Mfg. Co., Bloomfield, N. J.—electric motors and repair parts.

Manning, Maxwell & Moore, Inc., Bridgeport, Conn.—thermostatic switches.

Harrison Radiator Div., GMC, Lockport, N. Y.—repair parts: heat exchangers.

Ward Leonard Electric Co., Mt. Vernon, N. Y.—repair parts, electrical control equipment.

Johnson Motors Div., Outboard Marine & Mfg. Co., Waukegan, Ill.—repair parts, gasoline engines.

Navy Purchasing Office Washington 25, D. C.

Kennedy Mfg. Co., Van Wert, Ohio—tool chest, machinist.

Wilton Tool Mfg. Co., Chicago—vises, bench, machinists', and woodworkers rapid action types.

Birtman Electric Co., Rock Island, Ill.—vises, bench, machinists' etc.

Star Expansion Products Co., New York—gages, socket, miniature radio tube plug.

American Scale Co., Kansas City, Mo.—vises, bench machinists' type.

Century Tool Co., Philadelphia—tools, burnishing surface relay contact.

J. O. Mfg. Co., South Gate, Calif.—drills, hand, adjustable.

Reasor Mfg. Co., St. Charles, Ill.—reamers, various.

Diagraph Bradley Industries, Herrin, Ill.—machines, stencil cutting, etc.

Scinky Bros., Chicago—machine, spot welding.

General Hardware Mfg. Co., Inc., New York—holders, drill, metal folding.

Ingersoll-Rand Co., Washington, D. C.—hoists, pneumatic, trolley type.

Diamond Calk & Horseshoe Co., Duluth, Minn.—wrenches, adjustable, various.

Westinghouse Electric Corp., Washington, D. C.—coolers, drinking water, electric.

David Maydole Tool Corp., Washington, D. C.—hammers machinists's, type I, ball peen.

Hughes-Keenan Corp., Delaware, Ohio—truck, crane, 10,000-lb capacity.

J. I. Case Co., Racine, Wis.—tractors, warehouse 7500-lb capacity.

Bureau of Ships Washington 25, D. C.

Allis-Chalmers Mfg. Co., Washington, D. C.—transformers.

C. H. Wheeler Mfg. Co., Philadelphia—hoisting equipment.

Modine Mfg. Co., Racine, Wis.—heaters.

Port Houston Iron Works, Inc., Houston, Tex.—barge, deck or liquid cargo.

Crocker-Wheeler Div., Elliott Co., Washington, D. C.—generators.

R. G. LeTourneau, Inc., Peoria, Ill.—mobile airplane crash crane.

Babcock & Wilcox Co., New York—downtake header.

Northern Equipment Div., Continental Foundry & Machine Co., Erie, Pa.—parts for feed water regulators.

Yale & Towne Mfg. Co., Philadelphia—hoist, chain, electric.

Wesco Steel Co., Oakland, Calif.—barges, lighter.

Albino Engine & Machine Works, Portland, Ore.—barges, lighter.

I.T.E. Circuit Breaker Co., Philadelphia—tooling for production of AQB, 225 amp, 355 volt.

Martinolich Shipbuilding Co., San Diego, Calif.—barges, lighter.

Warren Steam Pump Co., Inc., New York—pumps.

(Continued on page 199)

This $30,000 precision drill with hydraulically movable table is now in operation at Convair's San Diego division. The four-way movable table is comparable to a jig borer in accuracy and type of work accomplished, but costly jigs are unnecessary

Forming tank halves on a Clearing press at Lockheed.

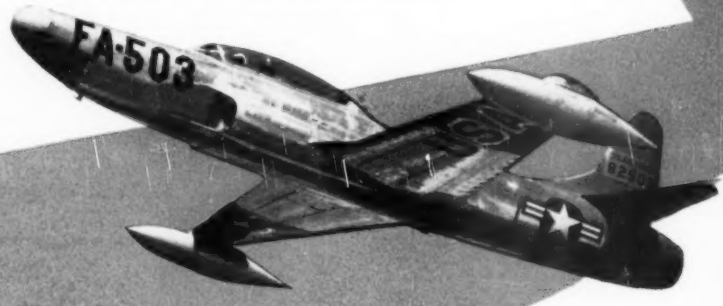
MISSION for Mass Production

To extend the range of jet fighters, wing fuel tanks have been developed to be dropped when empty. Two tanks are lost on every flight, so quantity production at low cost is imperative. Lockheed Aircraft Corporation turned to Clearing for a special hydraulic press to solve this problem. These expendable tanks are now being produced as required.

Providing the means to produce large quantities of metal items at low unit cost has been Clearing's chief concern since the company was founded. Parts even larger than shown here, and other parts tiny by comparison, are being turned out economically on Clearing presses today. It will pay you to consult Clearing with your problems.

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET ★ CHICAGO 38, ILLINOIS



CMC CLEARING

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

Navy Purchasing Office, New York

Vickers, Inc., Detroit—pump parts.

Turbine Equipment Co., New York—tools, pumps, repair parts.

Quartermaster General (USMC) Washington 25, D. C.

Demoster Bros., Inc., Washington, D. C.—trash collection equipment.

Armco Steel Corp., Middletown, Ohio—stainless steel.

International Harvester Co., Washington, D. C.—spare parts.

Fort Wayne Truck Parts & Equipment, Inc., Ft. Wayne, Ind.—spare parts.

Sun Electric Corp., Chicago—Automotive testing equipment.

Bay City Shovels, Bay City, Mich.—spare parts.

Worthington Mower Co., Washington, D. C.—lawn mowers.

Electric Auto-Lite Co., Toledo—spare parts.

NAVY AVIATION AWARDS

Aviation Supply Office Philadelphia, Pa.

C. J. Hug Co., Inc., Hammond, Ill.—electric clocks.

Magnaflux Corp., Chicago—rectifiers.

Electric Auto-Lite Co., Toledo—aircraft engine spark plugs.

Dispatch Oven Co., Minneapolis, Minn.—electric ranges.

Jack & Heintz Precision Ind., Inc., Cleveland—inertia starters.

Willis & Geiger, Inc., New York—vest assemblies.

Heli-Coil Corp., Long Island City, N. Y.—tool kits, extracting tools.

National Marking Machine Co., Cincinnati—marking machines.

Coates Electric Mfg. Co., Seattle, Wash.—electric furnaces.

Maryland Electronics Mfg. Co., College Park, Md.—receiver-transmitter, spare parts.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind.—maintenance parts P&W engines, carburetor assembly, brake assembly, nozzle assembly.

Harrison Radiator Div., GMC, Lockport, N. Y.—coolers.

Graybar Electric Co., Inc., Long Island City, N. Y.—electrical bells.

Westinghouse Electric Supply Co., Long Island City, N. Y.—junction boxes.

Avon Electrical Supplies, Inc., Jamaica, N. Y.—junction boxes.

Greer Hydraulics, Inc., Brooklyn, N. Y.—unit, propeller governor test.

Solar Aircraft Co., Washington, D. C.—maintenance parts for R5C-1 aircraft.

Lockheed Aircraft Corp., Burbank, Calif.—parts, maintenance of P2V aircraft.

Jordan Refrigerator Co., Inc., Philadelphia—coolers, drinking water.

Aerol Co., Inc., Burbank, Calif.—wheel assembly, solid tail.

Cornelius Co., Minneapolis—regulator, valve, compressor and tank assemblies.

Liquidometer Corp., Long Island City, N. Y.—transmitter parts for use on aircraft.

Electric Products Co., Cleveland—frequency converter, rotating type.

Ohio Injector Co., Philadelphia—valves, gate, steel, to control oil, steam and water lines.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—maintenance parts for aircraft instruments; amplifiers, servos, units and links for aircraft.

Pesco Products Div., Borg-Warner Co., Bedford, Ohio—fuel booster pump.

E. K. Cournand & Co., Inc., New York—various parts for aviation armament.

Ideal Industries, Inc., Sycamore, Ill.—blowers, electric.

Hotpoint, Inc., Chicago—ovens, electric, for baking.

Air Associates Inc., Teterboro, N. J.—maintenance parts for use on actuators.

W. R. Ames Co., San Francisco—altar, aluminum.

Thomas C. Wilson, Inc., Long Island City, N. Y.—cleaning outfits, boiler tube, motor driven.

Airtool Mfg. Co., Springfield, Ohio—cleaning outfits, boiler type, motor driven.

AIR FORCE AWARDS

Air Materiel Command, Wright-Patterson AF Base, Dayton

Consolidated Photo Engravers & Lithographers Equipment Co., Inc., Chicago—continuous printer.

Grand Central Aircraft Co., Glendale, Calif.—engine overhaul.

Texas Engineering & Mfg. Co., Inc., Dallas—aircraft inspection and spare parts.

Purolator Products, Inc., Rahway, N. J.—aircraft oil filter.

Western Electric Co., Inc., New York—machinery & equipment.

Deepfreeze Appliance Div., Motor Products Corp., Chicago—machinery & equipment.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—driftmeter maintenance parts; transmitter; de-icer; control timer; aircraft spare parts; tuning assembly.

M. B. Mfg. Co., Inc., New Haven, Conn.—engine mounts.

Sperry Gyroscope Co., Great Neck, L. I., N. Y.—engine analyzers.

Westinghouse Electric Co., Dayton—tubes.

General Electric Co., Schenectady, N. Y.—turbocharger spare parts; machinery & equipment; regulators; clocks; amplifiers.

Gibson Refrigerator Co., Greenville, Mich.—machinery & equipment.

Norma-Hoffman Bearings Corp., Stamford, Conn.—machinery & equipment.

Murray Corp. of America, Detroit—machinery & equipment.

Frigidaire Div., General Motors Corp., Dayton—machinery & equipment.

Firestone Steel Products Co., Akron—engine components.

Willys-Overland Motors, Inc., Toledo—machinery & equipment.

Jefferson Electric Co., Bellwood, Ill.—transformers.

General Tire & Rubber Co., Akron—jack assemblies.

New Idea Div., Avco Mfg. Corp., Coldwater, Ohio—trailer and storage racks.

United Motors Service Div., General Motors Corp., Detroit—ground vehicle spare parts.

Hammond Mfg. Corp., Pasadena, Calif.—trailer.

National Farm Machinery Cooperative, Inc., Bellevue, Ohio—jack assemblies.

Meriam Instrument Co., Cleveland—stand assemblies.

Bell & Howell Co., Chicago—cameras and spare parts.

Magnaflux Corp., Chicago—magnetic inspection equipment.

Bendix Westinghouse Automotive Air Brake Co., Elyria, Ohio—trailer assemblies.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind.—nozzle assemblies, brake assemblies, wheel assemblies, carburetor assemblies, carburetors.

Heil Co., Milwaukee—trailer spare parts, fuel servicing trailers and semi-trailers.

American Marsh Pumps Inc., Battle Creek, Mich.—truck spare parts.

Weatherhead Co., Cleveland—aircraft hardware.

Linde Air Products Div., Union Carbide & Carbon Corp., New York—cylinder assemblies.

Addressograph-Multigraph Corp., Dayton—duplicating machines.

Ralph C. Coxhead Corp., Dayton—electric typewriters.

Bowser, Inc., Ft. Wayne, Ind.—service station fuel pumps.

Certified Chrome Furniture Co., Inc., Los Angeles—ladder.

General Metals Corp., Huntinton, W. Va.—aircraft hardware.

Devilbiss Co., Toledo—paint spray guns.

Electric Sprayit Co., Sheboygan, Wis.—separator.

Scott Aviation Corp., Lancaster, N. Y.—oxygen regulator assembly.

Thomas A. Edison, Inc., West Orange, N. J.—fire detection kits.

Aerial Machine & Tool Corp., Long Island City, N. Y.—bolt assemblies.

Graybar Electric Co., Inc., Dayton—fluorescent ballast.

Standard Steel Works, N. Kansas City, Mo.—trailer spare parts.

Simmons Bros. Inc., Long Island City, N. Y.—printer projection.

Electric Auto Lite Co., Toledo—ground vehicle spare parts.

Reiger Equipment Co., Inc., Urichsville, Ohio—cranes.

Dayton Aircraft Products, Dayton—table filming.

Hervlett Packard Co., Palo Alto, Calif.—voltmeter.

Wisconsin Motor Corp., Milwaukee—ground equipment spare parts.

Manley Div., American Chain & Cable Co., York, Pa.—hoist.

Worthington Pump & Machinery Co., Harrison, N. J.—pump spare parts.

Spicer Mfg. Co., Dana Corp., Toledo—truck spare parts.

Champion Pneumatic Machinery Co., Princeton, Ill.—compressor spare parts.

Lipe Rollway Corp., Syracuse, N. Y.—truck spare parts.

K-D Lamp Div., Noma Electric Corp., Cincinnati—ground vehicle spare parts.

M. C. Colpen Christer Corp., Los Angeles—rectifier.

Deutsch Co., Los Angeles—valves.

Carbonic Gas Equipment Co., Norwalk, Conn.—converter.

Rockwell Mfg. Co., Pittsburgh—trailer spare parts.

Seifreat Elstad Machine Co., Dayton—grinders.

General Metals Corp., Adel Div., Huntington, W. Va.—aircraft hardware.

B. F. Goodrich Co., Dayton—track block lockwashers and blades.

Durham Aircraft Service, Inc., Woodside, N. J.—aircraft parts.

Kindred Aviation Corp., Burbank, Calif.—engine parts.

Houston-Fearless Corp., Los Angeles—high temperature processing machines.

National Acme Co., Cleveland—machine tools.

Erie Foundry Co., Erie, Pa.—steam drop hammers.

Chicago Aerial Survey Co., Chicago—spare parts.

Fosdick Machine Tool Co., Cincinnati—radial drills.

Gisholt Machine Co., Madison, Wis.—machine tools.

Cincinnati Bickford Tool Co., Cincinnati—radial drill machines.

Potter & Johnston Co., Pawtucket, R. I.—machine tools.

Baush Machine Tools, Springfield, Mass.—drilling machines.

Carlton Machine Tool Co., Cincinnati—machine tools.

Pratt-Whitney Div., Niles-Bement-Pond, West Hartford, Conn.—Keller machines.

Beech Aircraft Corp., Wichita, Kans.—generator assembly.

U. S. Gauge Div., American Machine & Metals, Inc., Sellersville, Pa.—hydraulic pressure gage transmitter.

American Steel Co., Pittsburgh—commercial hardware.

L. C. Smith & Corona Typewriter, Inc., Dayton—typewriters.

Lycoming Spencer Div., Avco Mfg. Corp., Williamsport, Pa.—engine maintenance and overhaul parts.

Television Equipment Corp., New York—oscilloscopes.

Ford Motor Co., Dearborn, Mich.—fuel injection systems.

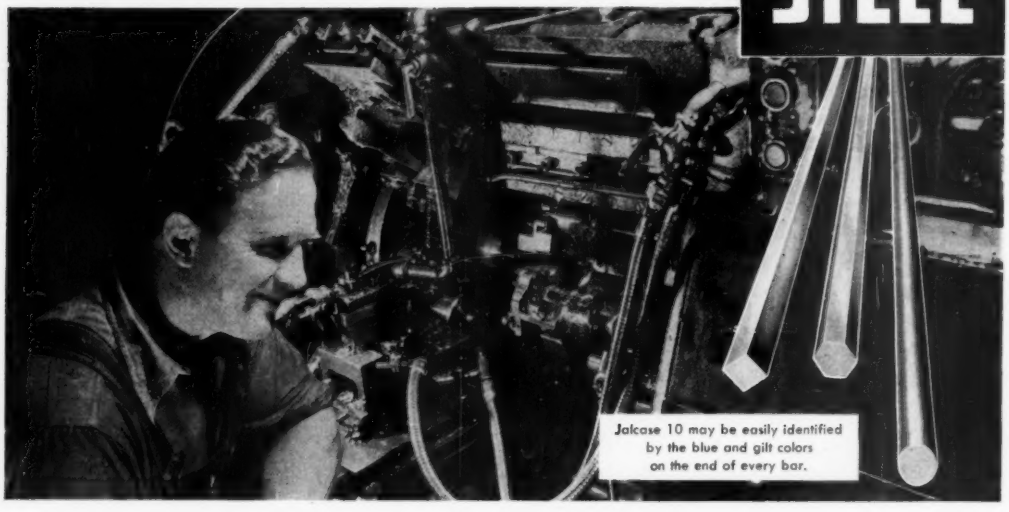
Moore-Eastwood Co., Wilmington, Ohio—rack assembly.

JALCASE 10 HELPS YOU

. . . eliminate a production step

. . . machine better cold-finished parts

J&L STEEL



Check these advantages of **JALCASE 10** *that offer you faster, more economical operations . . .*

NO HEAT-TREATING OF FINISHED PARTS REQUIRED

Many times finished part specifications on a job call for a high degree of hardness, but not as high as that obtained through heat-treating the finished part. In these applications, parts manufacturers and machinists have found it profitable to use Jalcase 10 and eliminate heat-treating altogether.

MINIMUM DISTORTION

Although Jalcase 10 is a high-carbon steel, distortion is cut to a minimum through special treatment during the cold-finishing process. As a result, when mechanical properties must be as high as possible and distortion held to a minimum, Jalcase 10 fulfills these rigid requirements.

HIGH MECHANICAL PROPERTIES

Jalcase 10 (A.I.S.I. No. C-1144) has the following cold-finished properties:

Minimum Tensile Strength	**115,000 lb/sq. in.**
Minimum Yield Strength	**100,000 lb/sq. in.**
Elongation in 2 inches	**7% (minimum)**
Reduction of area	**20 %(minimum)**
Brinell Hardness Range	**235—285**

PLUS . . . all the other advantages Jalcase steels have over ordinary screw stock:

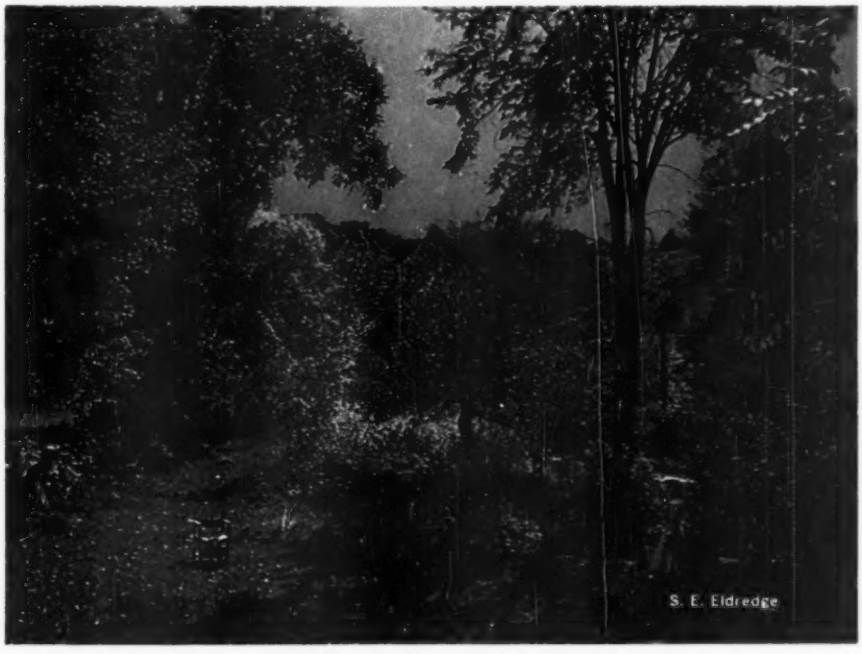
1. **lower cost per unit produced**
2. **finer finish on completed pieces**
3. **longer machine-tool life**
4. **less screw-machine down-time**

WANT MORE INFORMATION?

Send for our FREE booklet entitled "You Can Make Them Better with Cold-finished Jalcase." This illustrated booklet gives you complete technical information about *all ten* grades of Jalcase and how they can help you get better results in your machining operations. WRITE TODAY!

JONES & LAUGHLIN STEEL CORPORATION

402 JONES & LAUGHLIN BUILDING, PITTSBURGH, PENNSYLVANIA

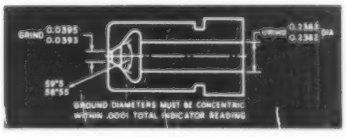


*What's in Vermont this month?**

SPECIAL MACHINE FINISH GRINDS INJECTION NOZZLE

Finishing fuel injection nozzles presents a unique group of internal grinding problems. The parts, as a rule, are small and demand extreme accuracy. There are three surfaces to be traverse ground and each one presents its own problem. First, the main bore, which is only .2363 inch in diameter has a seven to one ratio of diameter to length. Second, the tapered seat located at the bottom of this bore is to be traverse ground to an angular tolerance of one minute. Third, the .0394 inch hole, because of its extremely small size, demands grinding wheel speed far in excess of anything previously available. Fourth, a one-tenth concentricity is to be maintained on all three surfaces.

The Bryant Chucking Grinder Co. of Springfield, Vermont, has developed the No. 1309-W internal grinder for finishing injection nozzles at one chucking. Outstanding features include preloaded ball bearing slides for rigidity, an auxiliary angular slide for traverse grinding the tapered seat, Hi-Frequency wheelheads for

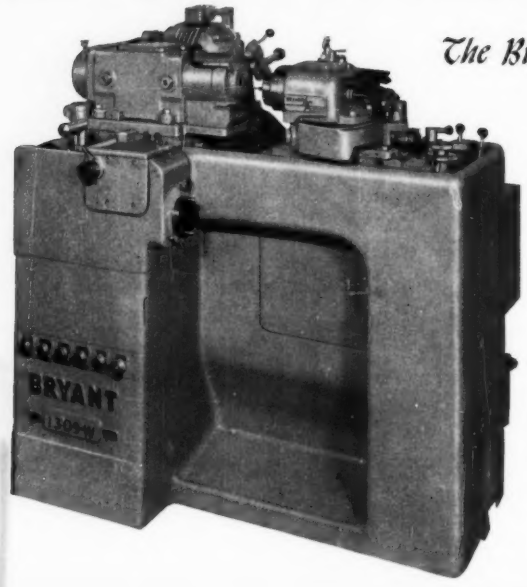


speeds up to 100,000 R.P.M., and a precision workhead indexing from one wheel to the other to maintain concentricity. Some specifications for this machine may be found on the back of this page.

* Remember . . . it won't cost to inquire!

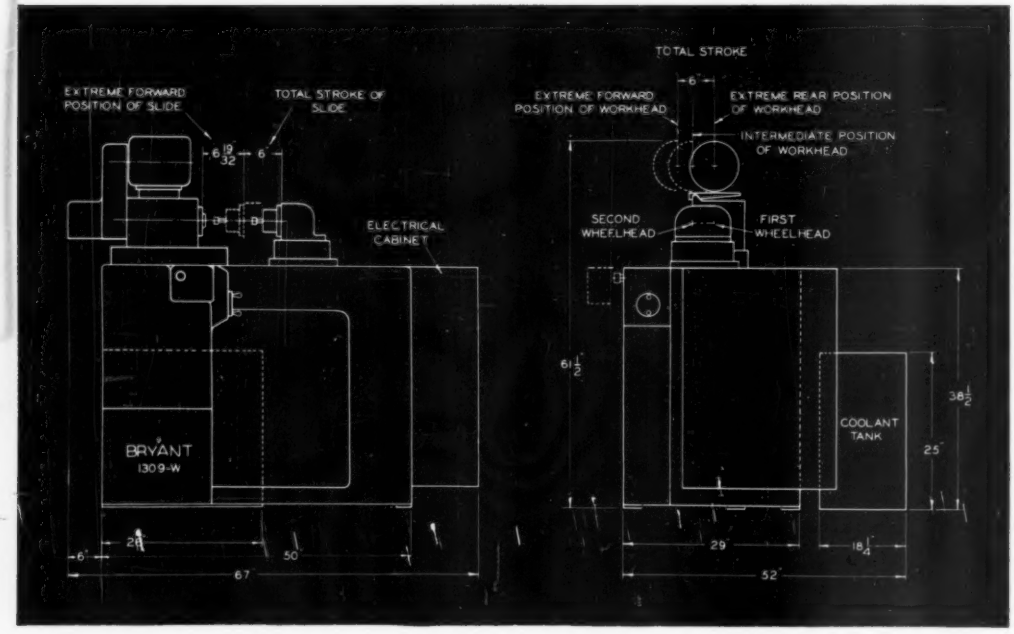
Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

FOR HOLE GRINDING



The Bryant 1309-W Precision Hole Grinder

This precision machine is semi-automatic, and is used for finishing two bores and a taper in a single chucking of the work piece. The No. 1309-W is ideal where straightness and concentricity are imperative. Each bore is traverse ground separately and size is controlled by a calibrated dial. The taper is traverse ground to assure a clean seat free from concentric grinding marks as produced by a plunge cut. Accurate angular control is assured by an auxiliary preloaded ball slide. Two wheelheads are used and the work is indexed from one to the other. Wheel speeds up to 100,000 R.P.M. are available on either or both wheelheads. The No. 1309-W has a total chuck swing of 9 inches, and a maximum grinding length of 3½ inches.



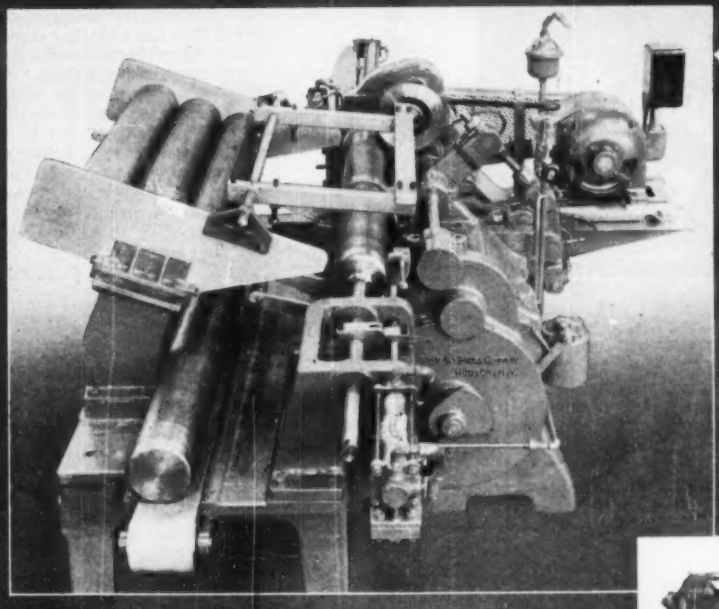
Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

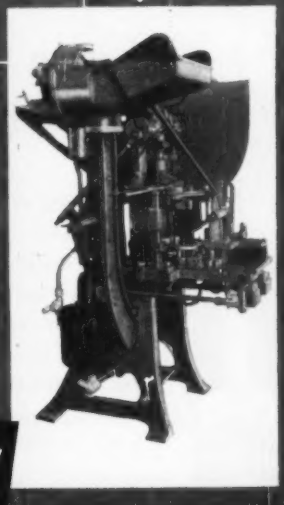
Serving the Defense Program

WITH

V & O

★ SHELL CASE TRIMMERS ★ PRIMER CAP INSERTERS ★ PRESSES and AUTOMATIC FEEDS

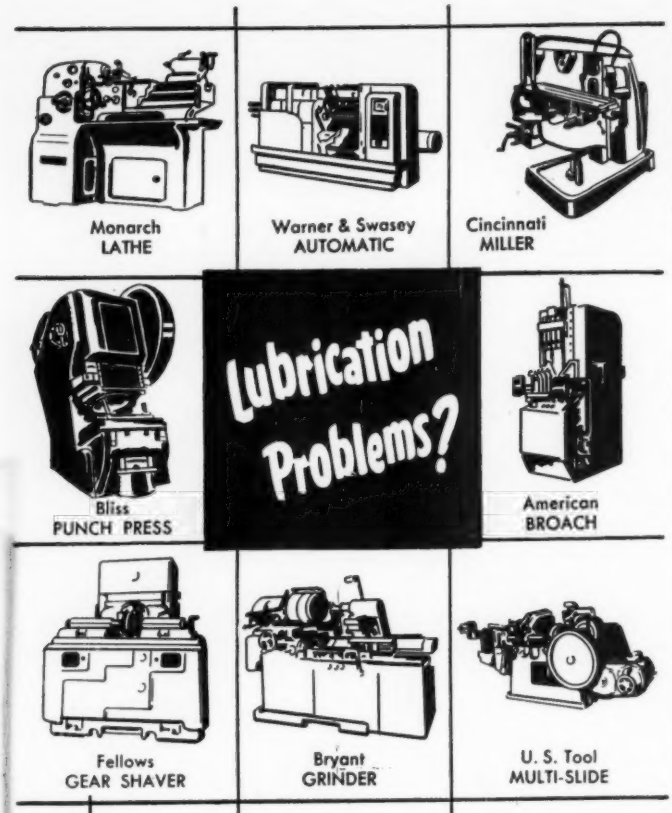




Also, Precision Power Presses and Automatic Feeds for Aircraft Parts, Cartridge Belt Links, Parachute Pulls, Detonators and Many Other End Products for Government Defense Plans.

Write for Details

THE V&O PRESS COMPANY
DIVISION OF EMHART MANUFACTURING COMPANY
Builders of Precision
POWER PRESSES and FEEDS
Since 1889 HUDSON, N.Y.



not on these machines!

...they're all BIJUR equipped

Every one of these machines is designed for continuous production. This is made possible by the built-in Bijur lubricating system. It oils the machine during operation and reduces bearing wear by controlling oil feed *at the bearings*. In both cases, it converts down-time for maintenance into more time for production. When you buy a Bijur-lubricated machine, you're assured of built-in bearing protection.

754

Write for Bulletin MW

BIJUR

LUBRICATING CORPORATION

Rochelle Park • New Jersey

time. For these to be practicable, material must be available to meet normal demands, without the need to check stocks. This necessitates reliable records, and pilfering can hardly be recorded. The articles must be made at a price, and the cost of private jobs cannot be included, whether as "material lost in shop" or other excuse. "Petty, isn't it?" suggested a judge when a wealthy corporation sued a workman for stealing two or three copper rivets; but when the corporation's submission was heard, that two rivets per man (they employed many thousands) per day could constitute a serious loss, the pettiness was seen to disappear. Thefts may be large or small; it is a matter of degree, but it is still stealing and not one of these people would feel complacent if the man next door had pinched his milk or this week's butter. No difference in principle, only in degrees. A hard fact, but facts *are* hard.

P. F. Edwards
Lindum, England

•

"Hew to the line of right; let the chips fly where they may." A foreman who follows this admonition in his strict adherence to the company's property rights may stir up some trouble in hurt feelings and such, but he is doing his duty as management's representative in running an efficient department and eliminating theft. Strict enforcement of shop rules regarding stealing of company property should be an unquestionable "must" in the foreman's line of duty. Discipline will suffer if this is not done. Troubles of this sort are like babies, they grow larger by nursing.

Employees found guilty of "swiping" tools or materials should be prosecuted to the fullest extent of the law. However, it should be noted that employees do not always realize they are stealing when they appropriate company property. By a curious twist of mind, they convince themselves that for this or that reason the company is "gypping" them, and they have the right to "get even" by taking something which they need or think they need.

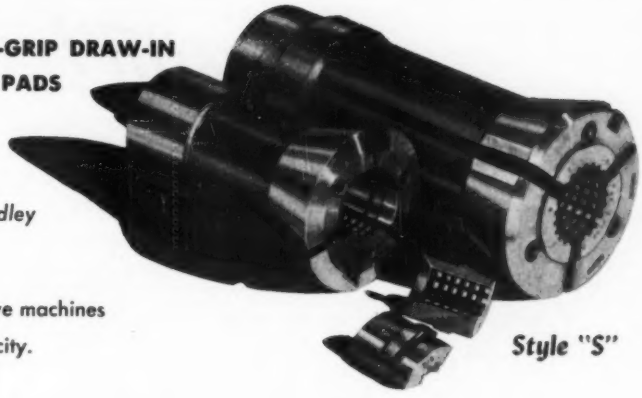
"Two wrongs can never make a right." The foreman who is fearful that strict adherence to the company's property rights is just looking for trouble is going to find more trouble in increased thievery. One plant found that the following method helped minimize this annoying problem of petty theft and "lifted property." Instead of verbally repeating over and over again to all the work-

HARDINGE ELMIRA, N.Y.

STYLE "S" SURE-GRIP DRAW-IN MASTER COLLETS and PADS

Cleveland
Cone
Greenlee
Gridley and Acme-Gridley
National Acme
New Britain

Available for all sizes of above machines up to and including 3½" capacity.



Style "S"

HARDINGE Masters and Pads for BETTER PERFORMANCE and BETTER PRODUCTION

HARDINGE ELMIRA, N.Y.

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MASTER FEED FINGERS and PADS

Brown & Sharpe
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Available for all sizes of above machines up to and including 3½" capacity.

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Ask for Style "S" and Style "B" Bulletins which give all performance features, price savings, and ordering information.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

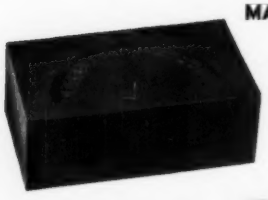
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

MARKING TOOLS TO GIVE YOUR PRODUCT

The Mark of QUALITY!

TYPE HOLDERS AND STEEL TYPE

Parker precision press and hand marking type holders are engineered for quick, accurate interchangeability of type. Type is furnished in all standard character sizes from 3/64" to 1/4" or in special type and symbols to your specifications.

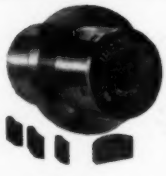


MARKING DIE FOR AZIMUTH SCALE

Sharp, clean, raised 1° increments and a double row of perfect figures, from 10 to 170 in this semi-circular azimuth scale all hardened into a solid tool steel block. Parker dies cost less because they perform perfectly—longer.

STANDARD OR SPECIAL STAMPS

Parker steel trade mark, identification, part number of inspection stamps are made in dozens of standard shapes and designs. Special stamps in any quantity, any size to mark any material are also manufactured to your specifications.



REMOVABLE INSERT MARKING DIES

This removable segment die is used for stamping and coding military shell cases. Here one die replaces three used previously and eliminates two stamping operations, thereby decreasing marking cost by over 60%. Another application of Parker experience and craftsmanship.

HOT STAMPING DIES FOR PLASTICS

Dies like this for hot stamping plastics or wood are being manufactured continually by Parker. The most elaborate customer specifications are quickly and expertly transferred from blue print to fine tool steel and expertly heat treated and finished for longer life.

SEND FOR THE PARKER GREEN BOOK TODAY!

Marking Dies, Marking Machinery, Tracer Controlled Machining, Keller Machining, Two and Three Dimensional Engraving, Hobs and Hobbing and Special Machining.

INVESTIGATE THE FLEXIBILITY OF PARKER'S FACILITIES TODAY!

THE PARKER STAMP WORKS, INC.
MARKING DIE DIV. MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker

ers the penalty for infraction of the shop rule regarding thefts, this company undertook to hold down recurring petty thefts on the part of its employees by adopting the policy of periodically confirming the rule against theft by a personal letter to each man. A copy of this letter, given to every worker, emphasized the seriousness of this offense and its penalty. An employee would not be likely, due to forgetfulness, to repeat the same mistake. This notice was signed by the foreman, the plant superintendent, and the lead man. The employees were also requested to sign a receipt for this letter, in order to indicate in writing that they individually received this notice.

One of the contributions which one company makes to employee-employer relations at its plant is publishing an annual report of the cases of theft in the plant and how they were handled with a view to the future reduction and elimination of theft of tools and material in the plant. It is an interesting document in discipline control. An analysis of the cases reviewed during the year shows that theft from the company or from fellow employees accounted for 18 cases, in 12 of which job-termination was found necessary. The current higher cost of tools, such as adjustable wrenches, micrometers, etc., has seemed to encourage some irresponsible individuals to steal them. Prompt action by the company, including police action in some cases, has kept these cases to a strict minimum in recent months.

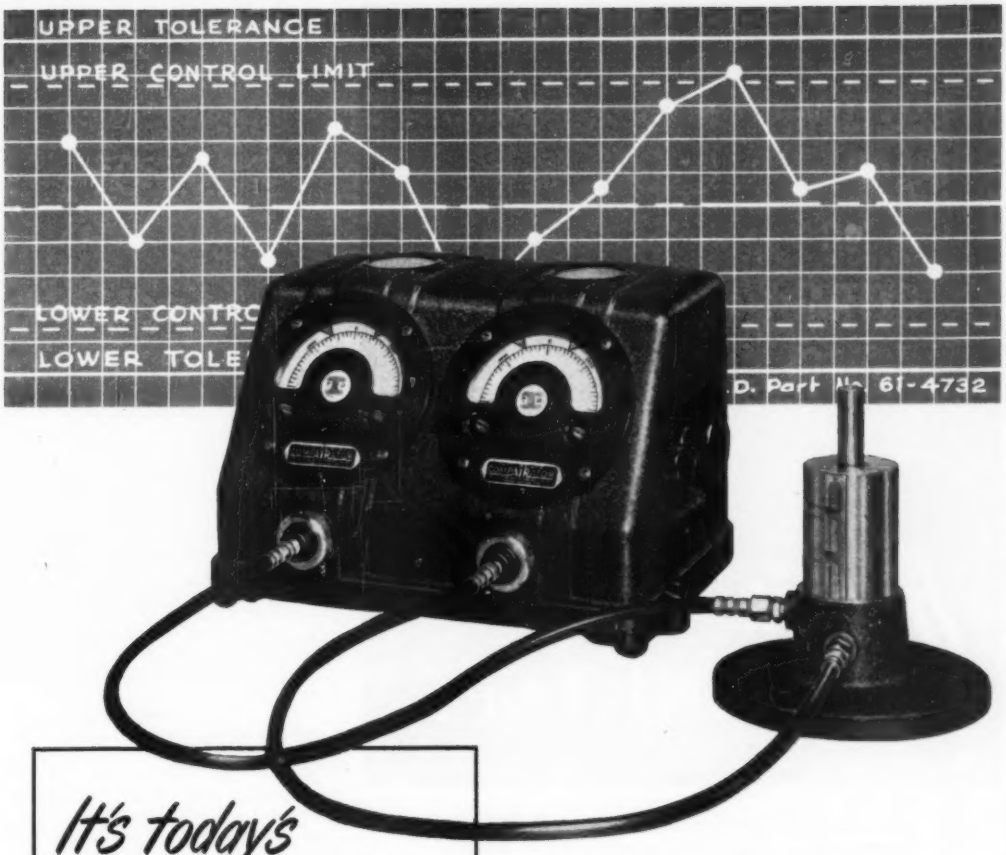
Although "there is honor among thieves," there is no honor for a foreman who hesitates to investigate theft of company property for fear of stirring up trouble. As Franklin said, "If principle is good for anything, it is worth living up to."

Harry Kaufman
Philadelphia

•

Judging the case in the light of Al's anxiety about a 10-in. hunk of yellow brass and a piece of tool steel, I take it that his department is a small one and that these materials play an important role in his production. If this conclusion is right, I don't agree with Ed that such losses should be considered necessary or unavoidable. If, on the other hand, large quantities of materials are going through every day and a man steals only once, it would be embarrassing for the other men if Al searched them every day when they were going home.

Then what is Al going to do in the first case mentioned? In the first place he should demand that all ma-



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—the Taft-Peirce CompAIRator

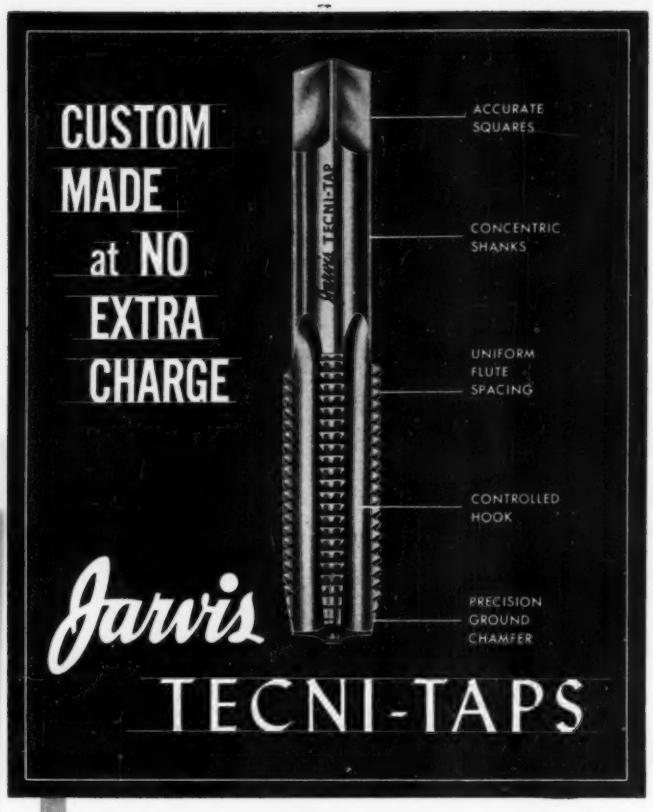
For economical use of Statistical Quality Control, the ideal gage is a versatile one—a gage suited to *trouble-shooting* as well as to permanent installations. The Taft-Peirce CompAIRator *is* that gage!

The quick-lock arrangement permits easy and rapid changing of gaging members. Magnifications can be changed in a matter of minutes to provide scale ranges as wide as .008" in .0001" increments or as fine as .001" in .000025" increments.

It is a completely self-contained, easily portable unit, which can "take it" in the shop. Stand it on a machine — jars and vibrations do not affect accuracy! Use long extensions — response is still virtually instantaneous! Write today for Catalog 610.

THE TAFT-PEIRCE MANUFACTURING COMPANY
Woonsocket, Rhode Island

For Contract Service: Design and Manufacture of Tools, Dies, Jigs, Fixtures, and Complete Machines.



You pay nothing extra for having Jarvis Tecni-Taps custom made. Depth and width of flutes, hardness, hook, proper chamfer and other vital factors are carefully determined by qualified Jarvis personnel. The result — a ground-from-the-solid Tecni-Tap that gives you the maximum in accurate, long-lived, trouble-free service.

Call in the Jarvis factory-trained service engineer. He will gladly help you with your tapping requirements — show you how Jarvis custom-made Tecni-Taps can save you money and increase productivity.

For additional literature, write: The Charles L. Jarvis Co., Middletown, Connecticut.

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QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

terial not used for a given job be returned to the storeroom. If this is carried out properly, I think Al could leave the matter for a few days to see if the theft is repeated. If it is not repeated, he ought not to worry about his running inventory for the future. But Al should, in any case, report the incident to Harrison to free himself of suspicion of inefficiency.

If the theft is repeated, he should again take the matter up with Harrison and recommend that he inform the shop steward about what had happened or air the question at the first meeting of the Production Committee. The majority of the workers are honest and would soon find out who was stealing and tell him to stop it. If nothing is done, I agree with Al that small tools would be missing next week or even earlier.

Only the thief himself would expect anyone to get away with anything. Not one in a hundred of any gang of men in any shop would allow pilfering to start or take place. If much material is stolen, it might be necessary to arrange a searching room at the gate and pick out a changing number of men every day and search them. One day, every 10th man might be taken in and the next day, every 12th, and so on.

There is electrically operated apparatus on the market for this purpose. I don't think the working force has anything against such an arrangement if the matter is handled the way outlined above.

A. E. Fristedt
Stockholm, Sweden

•

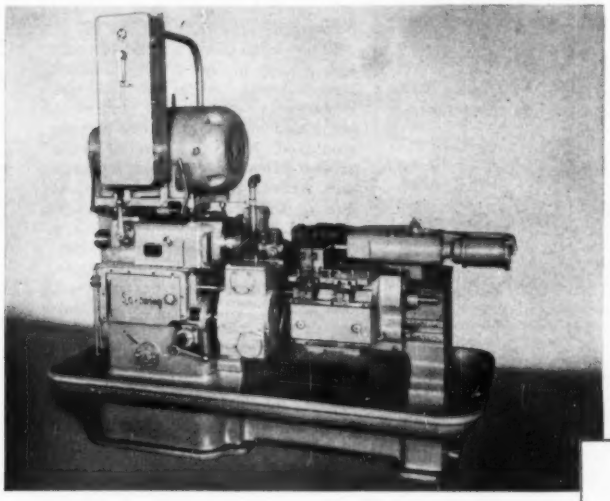
It appears that a hunk of brass and a piece of flat tool steel are missing. Well, I would not be surprised if the hunk of brass is now an ornament on the fireplace of one of his men; it is more than possible that the nice piece of flat tool steel (if it could be made into a carving knife) will probably be slicing somebody's Thanksgiving turkey.

When we were youngsters in the shops long ago, there was always somebody making some ornament for the fireplace or a carving knife for the home. That was long before all material was checked out of the shop's store to the fellow in the shop.

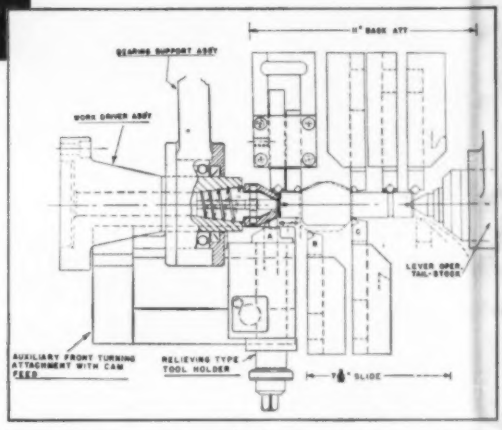
Most of the articles that used to form the bulk of things stolen from the shops were small drills, small bolts and nuts, screws, nails, rivets, soldering material, oil cans with oil, abrasive paper, and iron and brass washers. Of course, these are only trifling in cost, but when the majority of the employees all swiped some

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



MODEL "LR" *Lo-swing* TURNS BOTH ENDS OF GEAR SHAFTS IN ONE OPERATION



Problem: Turn, square and chamfer both ends of Gear Shafts in a single operation.

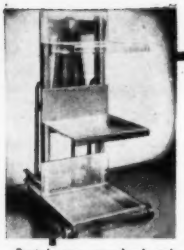
Solution: The Model "LR" Automatic *Lo-swing* Lathe selected for this job was equipped with one standard two-slide front turning carriage, one 11" wide back squaring attachment and one special auxiliary front turning attachment arranged for feeding towards the tailstock. Tools A-B and C, as shown in the line drawing, start cutting simultaneously. Tool A feeds in the direction of the tailstock to the position shown by dotted lines, and then returns to the starting position before tools B & C, which feed towards the headstock, reach the end of their cut. All shoulders are faced and chamfered and one diameter grooved immediately after the front tools have ceased cutting. All slide movements are cam operated and cannot get out of time.

A spindle extension which runs in its own bearing, provides sufficient space for the auxiliary front turning attachment. Note also the balanced driver with two tongues which fit into a groove in the end of the gear shaft providing an efficient method of driving the gear shaft.

Seneca Falls engineers welcome inquiries involving difficult and unusual machining problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

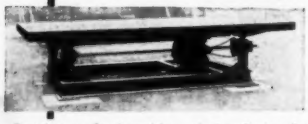
PRODUCTION COSTS ARE LOWER WITH *Lo-swing*



Portelvator; standard style "A"; capacity, 2000 pounds; lift, 15".

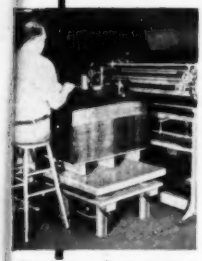
Portelvator; standard style "S"; capacity, 1000 pounds; lift, 52".

Portelvator; fixed position; basement installation for extra high lift from ground floor.



Portelvator; fixed position; pit installation for positioning truck and trailer beds to loading platform.

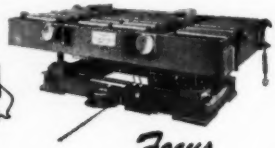
Portelvator; portable, elevating; for the movement and positioning of automobile body dies.



Portelvator; fixed position, automatic, self-leveling; for sheet feeding operation.

Portelvator; portable, elevating, tilt top; to facilitate removal and emplacement of bus motors.

Portelvator; fixed position; pit installation for "below and above floor level" operation; sheet feeding.



Portelvator; fixed position, roller top, elevating, die transfer table; self-loading and self-discharging; capacity, 25 tons.

Focus
on the
MOVEMENT and POSITIONING
of
TOOLS and MATERIALS

The devices shown here are typical of standard and special PORTELVATORS© regularly used by industry to effect the smooth movement and accurate positioning of tools and materials. The record of production economies brought about by the use of such devices is astounding.

Doubtless the application of a similar device will improve your production also. We will be happy to furnish you with details of construction and operation. Ask also for our Bulletin P-502 which gives full particulars about standard Portelvators.

THE Hamilton TOOL COMPANY
830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

of these every now and then the cost was serious for the employer.

You see, they could not buy just one or a few of anything they needed along those lines from anywhere at that time. Now, at the dime-to-a-dollar store, you can buy practically anything you need for the home or the workshop or the garage, or the car. It no longer pays to make home-spun articles.

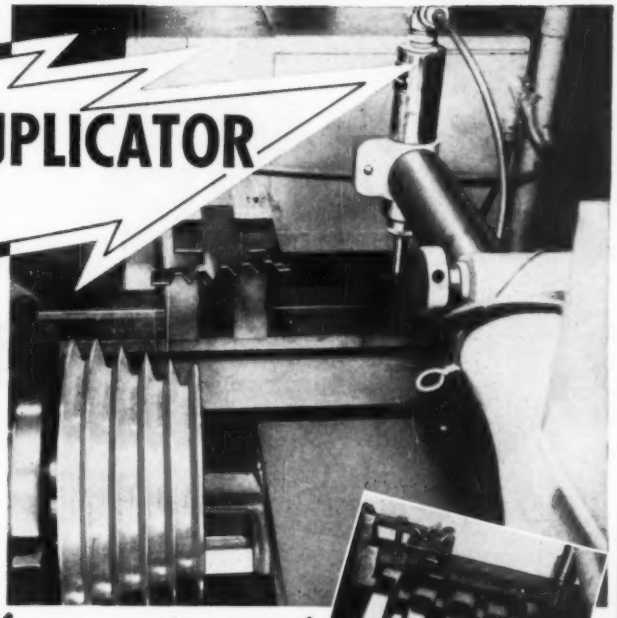
In one large plant, around 40 years ago, a chap needed a long piece of hose to water his garden. This was in every-day use in 40-ft lengths in the gun-boring shop where he was employed. He coiled one of these around his body, put on a top coat, and walked out of the gate. Just outside, the brass nozzle slipped and dropped to the pavement with a bang. Lots of fellows saw the incident, attracted by the unusual noise. He was reported, and he was fired.

A good system of preventing stealing of tools prevalent in Britain is to furnish each machinist with 12 tool checks. When he gets a tool from the store he has to leave a tool check bearing his number. When he returns the tool, he gets back the tool check. If he leaves, he has to have his full complement of 12 checks and a signed slip from the store boss to that effect before he can get any wages coming to him.

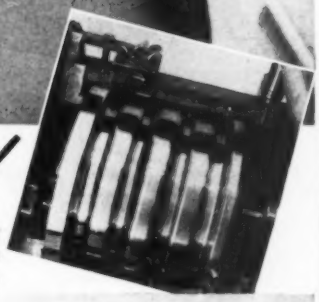
With regard to ordinary toolbits, there is no check on those generally. I don't know that it makes much difference. Why? Look in any toolmaker's or machinist's tool book when he starts as a new man. In 95% of the instances he will have lots of toolbits and maybe some twist drills, a toolholder or two, and a chisel or

"Oh — You wanted a compressed air line running through here?"

ELECTRONIC DUPLICATOR FOR REED-PRENTICE LATHES

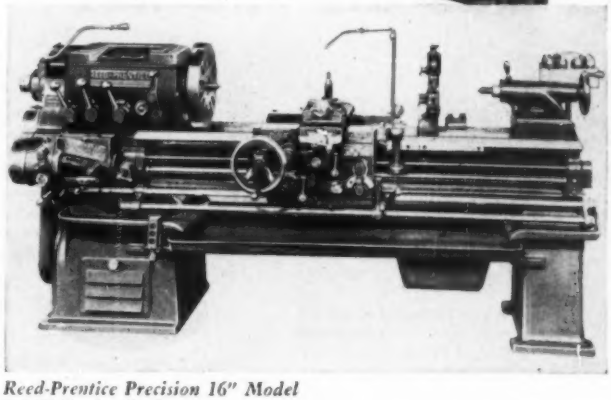


Assures high accuracy!



Closeup views of parts machined to very close tolerances through use of new Raytheon Duplicator.

The Raytheon Electronic Duplicator attachment applied to Reed-Prentice Lathes provides accurate, automatic duplication of parts requiring very close tolerances. Work can be held within .0005 limits. This new Duplicator makes possible continuous contour turning at unsurpassed speeds and accuracies. It can be used to great advantage in duplicating parts from a model for quantity production or small lots. Raytheon Electronic units have been used successfully on Reed-Prentice machines for the past ten years.



Reed-Prentice Precision 16" Model "AA" Engine Lathe

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They knew something was in the air!

WHEN FORD pried the lid off this box, a revolutionary new way to pack auto parts came to light. Custom was to spray bare metal surfaces with a preservative coating. Then, before parts were usable, they had to have a "hot bath." However, after months of open storage with only Angier VPI* Wrap to line this box, the uncoated parts came out shiny and clean. "No evidence of rust" said Ford's Export Division. Because VPI takes the rust-making power out of air and moisture, you know when this invisible vapor is in the air.

NOW EIGHT BIG NAMES IN THE AUTOMOBILE WORLD are saving priceless man-hours with Angier VPI Wrap. No messy coatings to apply means no "cleaning" when parts are unpacked. Now work areas are *clean . . . SAFER!* And because VPI requires no special equipment, valuable floor space is being released for production needs. Learn how this *proven* vapor method of rust prevention can benefit you. Write: Angier Corporation, Framingham 6, Mass.

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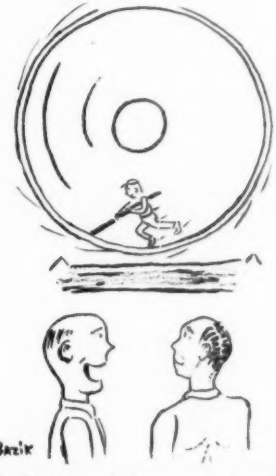
Sign below; attach to your letterhead

two. In by far the majority of cases, he has collected them in various plants, and he will use them on his new job. With every new man, you get the use of the tools from other plants in place of the machinist who leaves you and takes along with him some of yours, so what's the difference?

What, for example, is a good way to detect lifted property? Recently I was talking to a friend of mine who is a retired police sergeant, and who is now employed as chief of watchmen at a huge plant. I put that question to him.

He said, "well, you are aware that there is a large volume of all sizes of copper and brass rod and sheet used in the plant. On all jobs there is an estimated quantity required. When a job is started, a slip is given to both the workman and his boss. On the slip at the bottom is printed, 'unused material returned to store room.' There is an allowance for possible spoiled pieces, 5%, but the foreman is responsible for seeing that when the job is finished, whatever material is left over is returned to the store and the storekeeper signs the slip and returns it to the foreman for his files. It is obvious that, if strictly adhered to this will help to prevent pilfering."

"However," he added, "our worst trouble is the petty pilfering. Say there is a machinist working on a repair of equipment. His tools are spread around; somebody comes along and sees a wrench or a drill, picks up the tools after glancing around to see if he is observed, and walks off. They are not missed until



"Needless to say, he is a master spinner."

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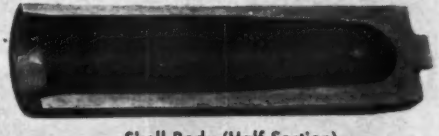


Shell Body (Half Section)

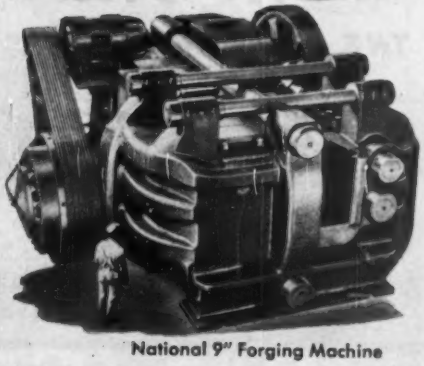
Aircraft Cylinder Barrel

Diesel Cylinder Liner

Aircraft Propeller Shaft

In World War II, the art of deep-piercing in Forging Machines came into its own. Forgings previously thought "impossible" were made routine by the pressing demands of war.

NATIONAL'S engineers and machines were "in the thick" of this forging development. Forgemen *still* choose NATIONAL Forging Machines for their difficult work . . . and *still* rely upon NATIONAL for assistance with their problems.



National 9" Forging Machine

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET, AND WIRE NAIL MACHINERY

Hartford Detroit Chicago

needed, no one has seen them stolen."

"Sometimes, when we have had a suspect, it has been arranged with his foreman to give him a job where he would have to use similar tools to what had been stolen, and several times it has proved successful. The suspect was caught using the stolen tool. However, we found stealers getting less and less each year, and it has gotten to the point where it is almost negligible."

Finally, there are lots of small shops of around 25 employees where all have the run of the whole place. I worked at one for a few months, and the owner informed me that he found it was cheaper to let each machinist feel he was a trusted employee than to have a storekeeper on the job all the time. He has been at the same spot 15 years.

Arthur Silvester
Niantic, Conn.

NEW BOOKS

LIST OF INSPECTED FIRE-PROTECTION EQUIPMENT AND MATERIALS — *Published by Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago 11, Ill. 221 pages. Free on request.*

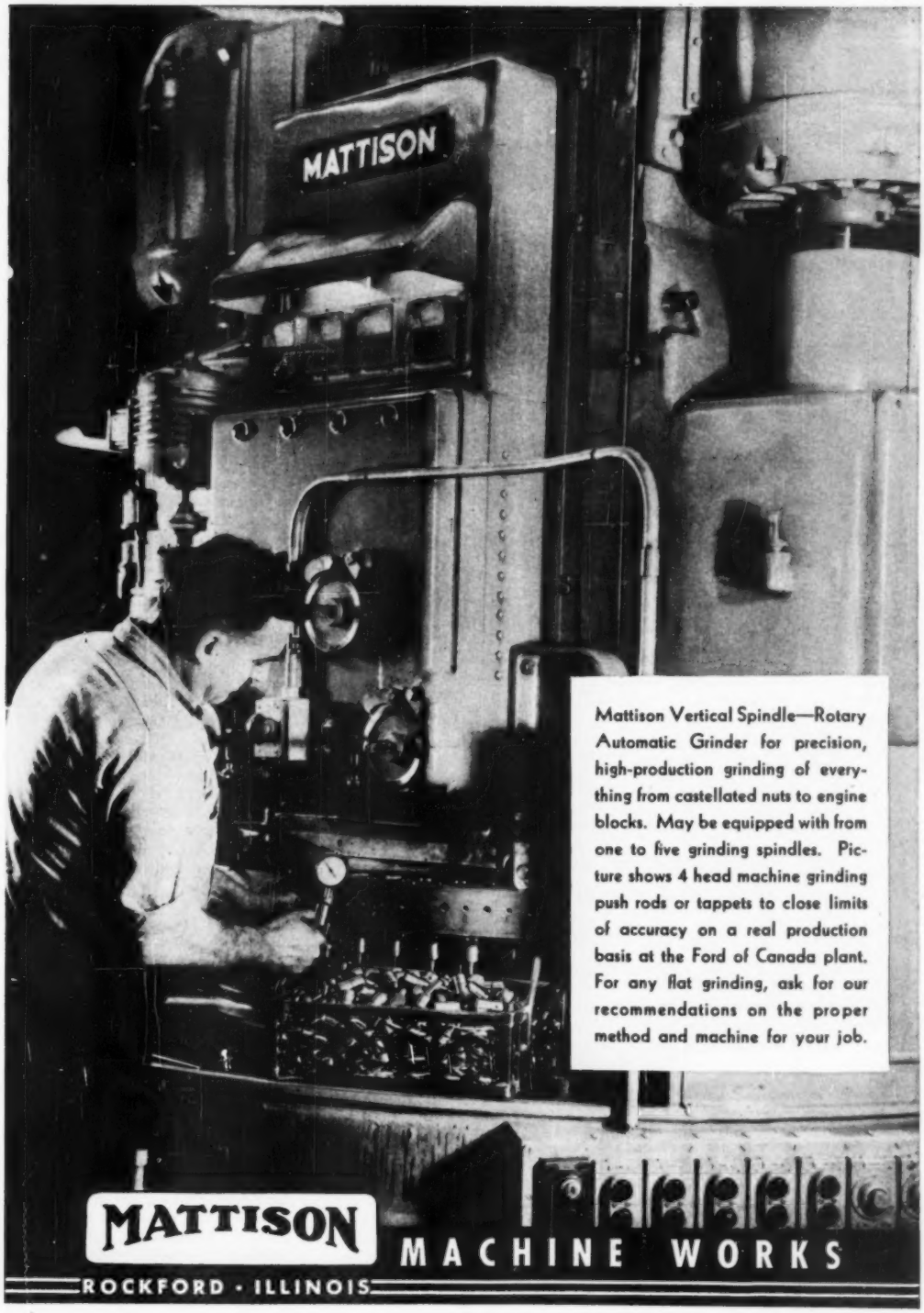
Booklet contains specifications, identification, analysis, and test results on fire-resisant and fire-fighting products such as building materials, extinguishers, pipe fittings, pumping equipment, signal appliances, sprinklers, and instruments. As of Jan 1 '51, this list replaces all others covering the same products.

•

METAL PROCESSING. *By O. W. Boston, Professor of Metal Processing, University of Michigan. Second Edition. 763 pages. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. Price $7.50.*

Prof. Boston is one of the best-known men in America in respect to leadership in development of the theory and practice of machine-shop work. He has carried out hundreds of research projects on metal cutting, cutting fluids and machinability problems, which have resulted in more than 200 technical papers.

Ten years ago, Prof. Boston brought out this book to serve as a



Mattison Vertical Spindle—Rotary Automatic Grinder for precision, high-production grinding of everything from castellated nuts to engine blocks. May be equipped with from one to five grinding spindles. Picture shows 4 head machine grinding push rods or tappets to close limits of accuracy on a real production basis at the Ford of Canada plant. For any flat grinding, ask for our recommendations on the proper method and machine for your job.

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By whatever standards you measure a lathe—bearings[1], capacity[2], gearing[3], apron[4], bed[5], power to spindle[6], accuracy[7]—whatever is important to you, you will find it completely satisfied in a SHELDON lathe.

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CHICAGO

SHELDON MACHINE CO., Inc., 4234 North Knox Ave., Chicago 41, Ill.

text for college use and also for use by production, tool and design engineers. In the new edition, he has expanded the material on machinability, sintered carbide tools, and machine tool drives, plus adding a chapter on surface quality.

The book covers design of product and planning for its manufacture, then goes on to discuss processes and equipment in detail. One strong feature is the complete and authoritative classification of tools and types of machines and processes. Chapter XIV on gears and their manufacture is particularly good in this respect.

A further feature of the book is a good bibliography at the end of each chapter. In short, Prof. Boston has produced an eminently readable book that will aid foremen and supervisors with their own problems as well as help in instructing their men.

•

NEW STANDARDS. *Available from the American Standards Association, 70 East 45th St., New York 17, or the American Society of Mechanical Engineers, 29 West 39th St., N. Y. 18, N. Y.*

STEEL BUTT-WELDING FITTINGS, *B16.9-1951. Price 75 cents.* These fittings, in sizes from 12 to 24 in., are used for pressure steam lines and oil-refinery pipe lines.

DRILL DRIVERS, SPLIT SLEEVE, COLLET TYPE. *B5.27-1951. Price 45 cents.* This type of driver is used in the automotive and mass-production industries to drive straight-shank twist drills.

MALLEABLE-IRON SCREWED FITTINGS, *300 Lb. B16.19-1951. Price 60 cents.* These 300-psi fittings are used primarily in severe piping applications: petroleum industry, railroads, ships, diesel engines, and steam at high pressure.

•

MECHANICAL MEASUREMENTS BY ELECTRICAL METHODS—*By Howard C. Roberts, Special Research Associate Professor, University of Illinois. Published by the Instruments Publishing Co., Inc., 921 Ridge Ave., Pittsburgh 12, Pa. 350 pages.*

Second edition of this book on electrical instrumentation includes no extensive revision of the first edition; therefore has material that is generally four to ten years old. The text includes some material on electronics —namely, on amplifiers and photoelectric circuits—but is generally confined to straight electrical principles and devices.

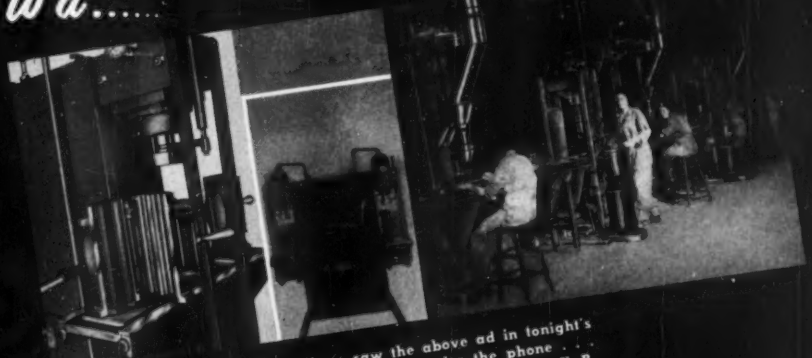
As a basic course in electrical

This ad....

HELP WANTED

Wanted: Company to design and build shell loading hydraulic presses. Must be fast, efficient and engineered for safety. World War II experience preferred.

FITS KRW *to a.....*



If we saw the above ad in tonight's paper, we'd reach for the phone . . . quick! The job's made to order for K. R. Wilson. During World War II, KRW engineers designed a faster and safer method for loading shells and incendiary bombs. Hundreds of KRW 1-station, 2-station and 4-station shell loading presses were supplied to bomb loading contractors across the country. The photo at left above shows a close-up of the shell case holder on a KRW 4-station shell loader (shown in inset). At right is a battery of KRW presses working at top speed in one of the nation's largest arsenals.

K. R. Wilson is set to do an even bigger job today. Almost two million dollars in new machinery and equipment have been added to our plant since World War II. So if you have shell-loading contracts, write, wire or phone KRW for the right equipment. We can go to work on your order at a moment's notice.

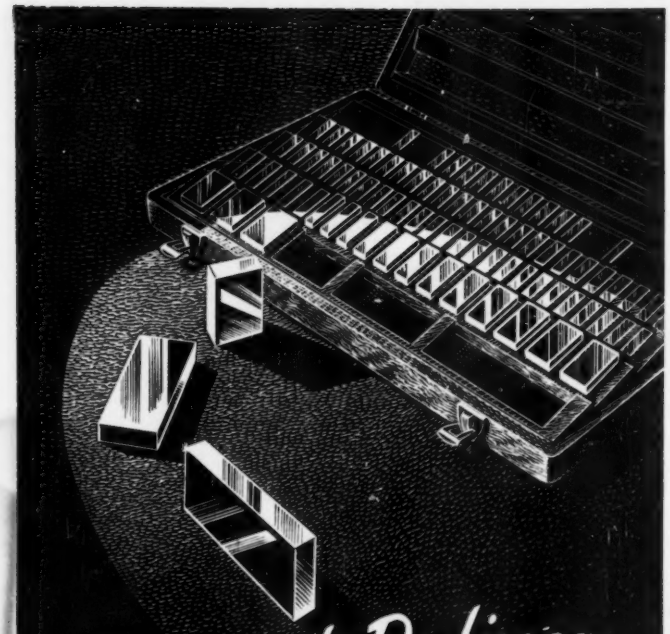
Send for

FREE NEW BOOKLET

It tells all about our plant, equipment, facilities and experience in war and peacetime production. It's yours for the asking. Write Dept. 11.

K R WILSON

215 Main St. • Buffalo 3, N. Y.



Prompt Delivery

H. D. BLOCKS and FIXTURES

For years Webber has dedicated itself to the production of gage blocks at a price that even the smallest shop can afford.

Quality and precision have not been compromised in this undertaking. Ask those who use them. Write for literature.

STANDARD STEEL BLOCKS

CARBLOX CARBIDE

ANGLE BLOCKS

Webber

GAGE COMPANY

12901 TRISKETT ROAD

CLEVELAND 11, OHIO

LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

measuring methods, the work covers gaging and measuring by means of capacity, inductance, resistance piezoelectricity, and by thermal and acoustic devices. It covers the ground in considerable detail, and the text is aided by a fair number of sketches, diagrams, and photos.

Probably the best use for the book is as a reference or basic course on the fundamentals of electrical measuring. The fine points and latest developments in auxiliary and more intricate devices can be picked up in a text specifically on electronic devices that often, but by no means always, replaces some of the older, basic electrical apparatuses.

•

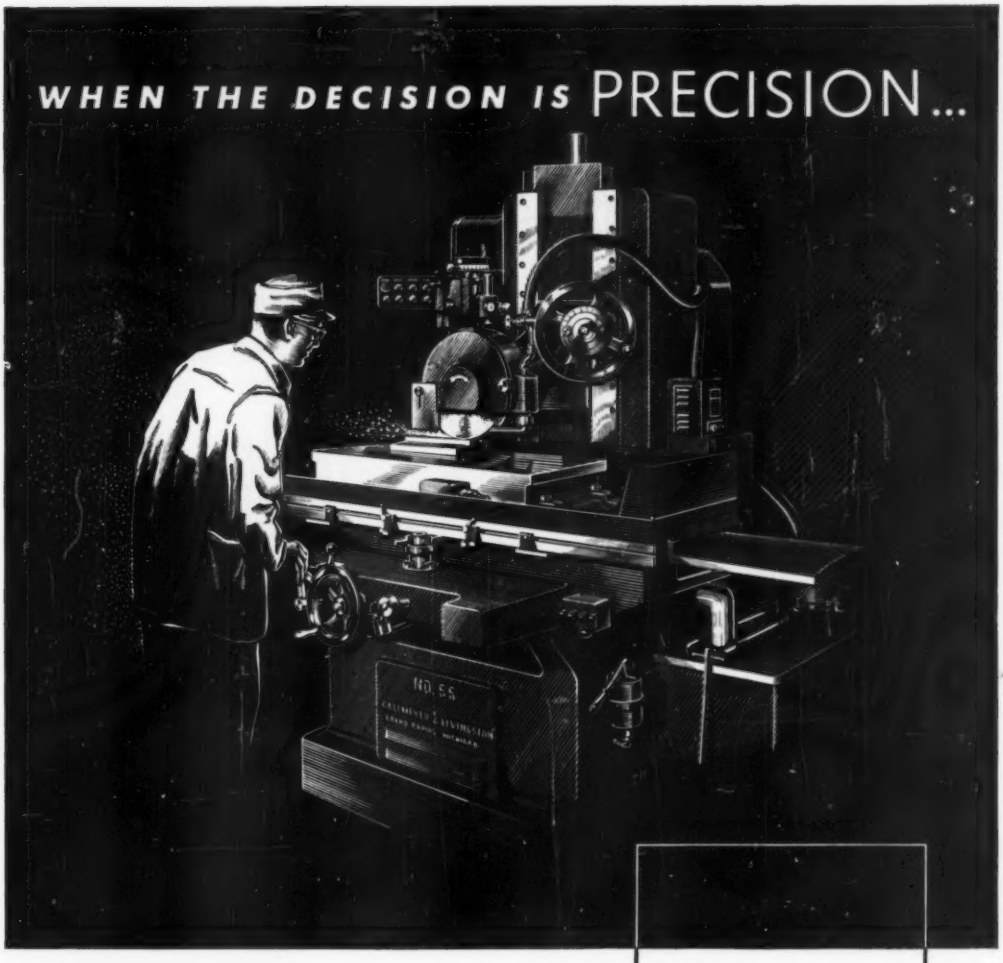
ENGINEERING AND WESTERN CIVILIZATION. *By James Kip Finch, Dean Emeritus of Engrg., Columbia University. Published by the McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y 397 Pages, 6 x 9¼ in. Price $5.*

Outlining the history of engineering from the beginnings about 50 centuries ago, this book takes a new approach. Accompanying social and economic conditions are related to their effect upon technological progress. It is an encompassing work interrelating all fields of engineering with the forces which so strongly affect its progress. Much widely scattered information is collected here and correlated.

Language is simple and straightforward and thoughts are clearly expressed. While the author attempts

"Step right up, gentlemen! Around and around she goes; where she stops, nobody knows."

WHEN THE DECISION IS PRECISION...



Where extreme tolerances are not required, the choice of any particular grinding machine may not be too important. But, where absolute precision is demanded, the choice is usually *Grand Rapids.*

Defense orders make it impossible to fill orders as quickly as we desire—but we know our customers can appreciate the reasons for delay. As always we'll do our best to serve you.

GALLMEYER & LIVINGSTON CO.
330 Straight Ave., Grand Rapids, Mich.

Grand Rapids Grinders
—World's finest

GALLMEYER & LIVINGSTON

ANY WAY YOU LOOK AT IT...

Are Best for You!

You're sure of a longer lasting, better working coolant pump when you specify Ruthman Gusher Coolant Pumps on your machines. Instantaneous copious coolant flow helps you raise production. Maintenance costs are at a minimum. There's no need for packing or priming. Heavy-duty pre-lubricated ball bearings require no further attention. Dynamically balanced rotating parts, simple construction with fewer parts to wear, assure you of long trouble-free life. Write us today.

THE RUTHMAN MACHINERY CO.

1818 Reading Road Cincinnati, Ohio

How to read with your eyes open for business

Read the ads! Every issue of this magazine contains ads that offer valuable services and useful products by which your business may be run more profitably.

The time it takes to read all the ads is time well spent. One ad alone can pay off – by informing you of new developments and new sources of supply, by helping you do a more efficient job. For example, you may locate one machine that will cut your production costs, or step up your output. Or you may discover that the equipment you've been waiting for is now available.

This magazine displays more ideas and merchandise than a trade exposition. Make every issue your buyer's guide. Read the ads as well as the articles. That's reading with your eyes open for business.

HEADQUARTERS FOR BUSINESS INFORMATION

McGRAW-HILL publications

F-22

to avoid factual detail, a great amount of the latter is included, and it is here, if anywhere, that criticism may be leveled, because names are misspelled and dates are wrong here and there. In an historical work of this quality and scope, absolute accuracy is essential, because other men will undoubtedly use it as a reference for many years.

This volume is easy to read, and will give the engineer a perspective difficult to obtain otherwise. It does, in fact, provide a picture of the interaction of social, economic and engineering forces that engineers need to evaluate both these troubled days and the future of our Western civilization.

Business Directories—Industrial Directories:

There are a number of industrial directories available from state or locality sources; none of them standardized in layout and arrangement, but many useful. Those listed below are a fair sample of what's available.—*Editor.*

GUIDE TO EXPORT PRODUCTS MADE IN CONNECTICUT—*Published by The State of Connecticut, prepared by Connecticut Development Commission, State Office Building, Hartford, Conn.* Includes coded listing of products of all types, plus directory of manufacturers' names by code numbers. 46 pages.

DIRECTORY OF IOWA MANUFACTURERS—*Published by the State of Iowa, Iowa Development Commission, Des Moines, Iowa.* Includes three sections, each indexed alphabetically; manufacturers by location, manufacturers by industry, and manufacturers (cross-indexed) by product. 154 pages.

DIRECTORY OF MINNESOTA MANUFACTURERS—*Published by the Minnesota Department of Business Research and Development, State Capitol, St. Paul 1, Minn.* Includes two sections; a fairly complete breakdown by industry and product, and listing by location. 400 pages.

DIRECTORY OF MICHIGAN MANUFACTURERS—*Published by Manufacturer Publishing Co., Detroit 26, Mich.* Includes classification by product and by location, cross-indexed. 103 pages.

MISSOURI DIRECTORY OF MANUFACTURERS—*Published by the Missouri*

★

DEMPSTER DUMPSTER SYSTEM

SERVING COST-MINDED MANAGEMENT FROM COAST TO COAST

. . . handling bulk materials of every description at phenomenal savings

Photos show the three simple stages of servicing a container. The Dempster-Dumpster, operated from hydraulic controls in the cab by one man, the driver, picks up each container, places it in carrying position, and hauls it to point of disposition where it may be dumped or set down intact.

● **The General Electric Company, well known for sound management, is among the hundreds of cost-minded manufacturers using the Dempster-Dumpster System of bulk materials handling . . . the system recognized across the nation for its efficiency and ability to reduce costs!**

Cuts Cost of Equipment and Operation — One truck-mounted Dempster-Dumpster performs the work of from 3 to 5 conventional trucks . . . reducing investment, maintenance and man hours tremendously.

Eliminates Standing Idle Time—Truck never stands idle while being loaded nor do loading crews stand idle while truck makes haul. One Dempster-Dumpster services any number of detachable containers ranging in size up to 12 cu. yds. and in a wide variety of designs best suited to the type of materials handled—be they bulky, light or heavy . . . solids, liquids or dust . . . trash or rubbish.

Eliminates Re-Handling of Materials—Dempster-Dumpster Containers are placed at the very spot where materials accumulate—inside or outside buildings. Materials placed in these containers remain there until taken to destination and dumped or set down intact.

Increases Efficiency, Sanitation and Good "Housekeeping"—The Dempster-Dumpster System is a complete, unified plan for plant-wide cleanliness. Containers built to handle trash and refuse are fire-proof, rat-proof and fly-proof. Contents cannot be scattered by wind or scavengers. Regardless of your particular materials handling problem . . . raw products, finished products, trash or rubbish—it will pay you to investigate the Dempster-Dumpster System now! A product of Dempster Brothers, Inc.

One Dempster-Dumpster Services All Containers. . . All Designs. . . All Sizes

DEMPSTER BROTHERS, 461 Dempster Bldg., Knoxville 17, Tennessee

Precision Built for Precision Production

PORTAGE *horizontal*

BORING, DRILLING & MILLING MACHINE - No. 4

● This machine has been designed to produce particularly accurate work in less time at lower cost.

It gives you sturdy rigid construction throughout. For example, the bed of the machine is a heavy, reinforced, one-piece casting without large, cored openings in the base walls under the column. This construction provides the rigidity necessary for the boring unit to produce accurate work at the high speeds essential to modern production.

Portage Machine Co. has always adhered to a sturdy well balanced construction and their machines have a reputation for quality, precision work year after year.

Investigate this modern, precision machine tool and convince yourself of its rugged, dependable construction. Full descriptive bulletin illustrating and describing its many precision features is available upon request.

THE PORTAGE MACHINE CO.

AKRON • OHIO • • DEALERS IN ALL PRINCIPAL CITIES

State Department of Resources and Development, State Office Building, Jefferson City, Mo. Includes three listings of manufacturers; by location, by name (alphabetical), and by industrial classification. 550 pages.

DIRECTORY OF VERMONT MANUFACTURED PRODUCTS—*Published by Vermont Development Commission, Montpelier, Vt.* Includes the three breakdowns: alphabetical, location, and product. 120 pages.

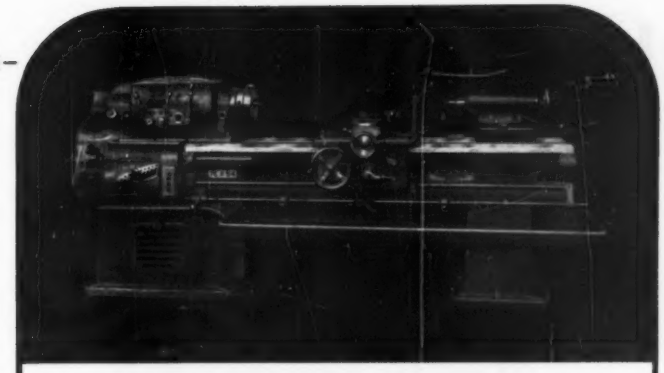
CLASSIFIED DIRECTORY OF WISCONSIN MANUFACTURERS—*Published by Wisconsin Manufacturers' Association, 633 N Water St., Milwaukee 2, Wis.* Includes compilations by: alphabetical names, location, product, and also trade names. This particular directory is an unusually complete and informative one. 800 pages.

INDUSTRIAL DIRECTORY OF NASSAU AND SUFFOLK COUNTIES—*Published by the Long Island Association, Industrial Bureau, Garden City Hotel, Garden City, L. I., N. Y. 125 pages. Price $5.* A compilation of brief information about manufacturers and businesses in the Long Island area, this directory includes a listing of businesses by location, an index by type of business, an index by product, and some general information about Long Island facilities.

The Engineer

The engineer is quite a guy,
His voice is soft, his manner shy.
You'd never guess, unless you knew,
The horrid things he'll do to you.
You have conceived a faint illusion,
For Fuller-Brush type distribution.
In general terms, with moving land,
You tell him all about it, and
Forget it as the lunch bells ring.
That's in the Fall. Late in the Spring,
He gives you with a cheery smile
The prints—not just a little pile
Or bundle—pretty near a bale.
You catch your breath. Your spirits quail.
"I thought a sketch or two!" you cry.
He looks at you and in his eye
There gleams the white-hot flash you see
When lightning splits an apple tree.
He answers, as his slide rule stretches,
"There is no such a thing as sketches!"
And so you try to understand
The miracle the man has planned.
You faintly murmer. "Let me see!
No tolerances?" "No!" says he.
"The clearances are ground to make

Standard Model—



MODERN Hendey

16", 18-speed engine lathes – for precision turning

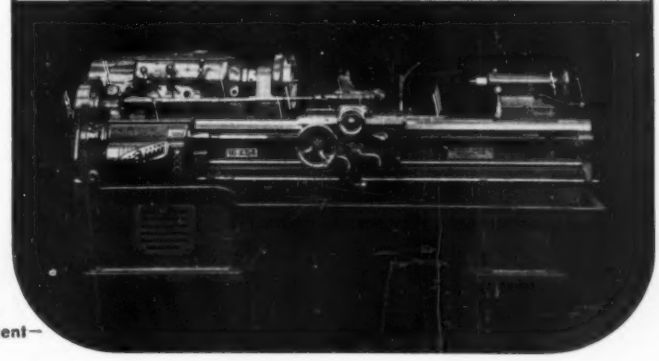
FEATURING induction hardened and ground precision bed ways

PLUS—

18-Speed Sealed Precision Geared Head.
Quick Change Gear Box Mechanically Oiled.
36 Thread Cutting and Feed Changes.
1½ to 80 Threads—.003 to .1666 Feeds.
Alloy Steel Gears in Headstock.
Gears Refinished After Heat Treatment.
Gear Shafts Mounted in Anti-Friction Bearings.
Anti-Friction Spindle Bearings Double Opposed, Pre-loaded.
Spindle End Indexed for Multiple Thread Cutting Without Disturbing Gear Train.
Apron and Carriage, Automatically Lubricated.
Quick Acting Levers Operate Longitudinal and Cross Feeds.
Feed and Split-nut Levers Interlocking and Fool Proof.
Quick Withdrawing Attachment for Threading.
Large Hole thru Spindle Accommodating Large Collet Capacity.
Spindle Nose Optional; Flanged Type Cam Locking, Long-taper Type Key Driven, Hendey Standard Threaded Nose.
Lathe Equipped with the New High Speed Apron Reverse for Lead Screw.
New Feed Dials, Large, Accurate and Quick Reading.
Micrometer Carriage Stop; Automatic Longitudinal Stops in Either Direction of Travel.
New Positive Cross Slide Stop.
New Re-inforced Bed Brackets with Anti-friction Bearing for Tail End of Lead Screw.
Special Clamping Device for Tailstock.

Every feature necessary for precision turning at modern production speeds is incorporated in the 16-inch, 18-speed Hendey engine lathe—in other words, *Built to Hendey's Modern Precision Standards.* The operator will find every convenience—from easy-operating controls to features that practically eliminate maintenance. Induction hardened and precision ground bed ways provide life-long precision for both carriage and tailstock. This modern Hendey Tool Room Lathe is available in standard and tool room models. The latter is shown below with sub-headstock for producing threads with long leads. *Write for catalog.*

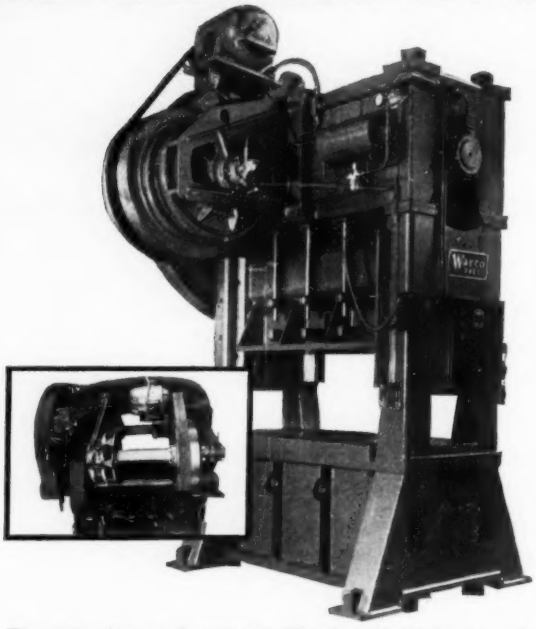
THE HENDEY MACHINE COMPANY
MAIN OFFICE & PLANT: TORRINGTON, CONN.
BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco
REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh



Tool Room Model with sub-headstock & relieving attachment—

Warco PRESSES

Pneumatic Clutch and Brake Minimizes Common Press Failure



The new **Warco** Pneumatic Clutch and Brake is not just another air clutch. It is efficient, safe, easy to maintain. Here is a partial list of **Warco** advantages:

- Carefully balanced strength-weight ratio requires less motor horsepower, consequently a decrease in power consumption; also allows clutch to run cooler, delivering longer trouble-free service.
- Mechanically interlocked clutch and brake plates eliminate all possibility of overlap between clutch and brake.
- Clutch is air actuated — brake is spring actuated. In the event of failure of air supply brake will be safely engaged.
- Piston rings are used in air cylinder of clutch, eliminating packing deterioration from heat.
- "O" rings are employed as static seals to eliminate air leaks.
- Full clutch torque possible at only 60 psi air . . . line pressure over this acts as a reserve in case of emergency.

The Warco Pneumatic Clutch and Brake is made in both single and multiple plate models, to meet the requirements of each individual press. It can be applied to presses in the field regardless of make. Write for additional data.

Federal WELDERS

THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO

Warco PRESSES

All end-thrust factors without shake.
The micro-finish of the bases
Assures long life of bearing races;
Dynamic balance of the ribs
And constant torquing of the gibs
Permit the electronic rays
To stabilize the table ways.
The thermal oil film through the section
Will greatly expedite erection!"
And it had just been your intention,
Per your disclosure of invention,
To have when nights again grew hotter,
An automatic 'skeeter swatter!'
Again the tragic truth is clear—
He is, *you're not*, an engineer.

Thorvald S. Ross

"— ex Navy man — all spit and polish — wish we could get him to run something on it though!"

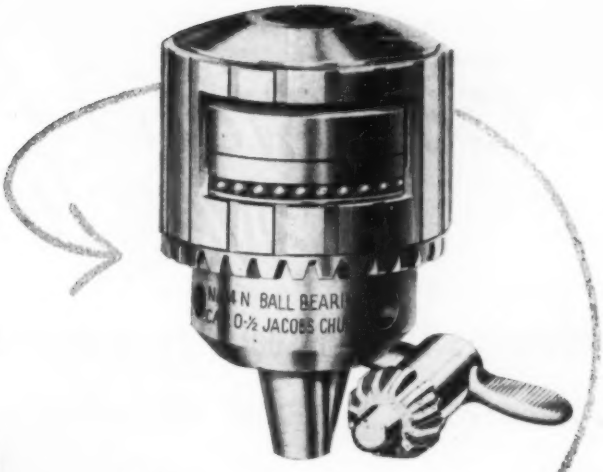
PLANT EXPANSION NEWS

• **Hannifin Corp.**, Chicago, has started construction of a new parts plant at Des Plaines, Ill.

• **Worthington Pump & Machinery Corp.**, Harrison, N. J., has broken ground for a new vertical turbine pump plant at Succasunna, N. J.

• **Aluminum Company of America,** Pittsburgh, will construct a new aluminum smelting plant at Wenatchee, Wash.

• **Cummins Engine Co., Inc.,** Columbus, Ind., is expanding its production and operating facilities by enlarging its present fuel pump



no other has so firm a grip...

Thanks to its ball bearing construction and frictionless grip, the Jacobs Ball Bearing Chuck easily registers the world's firmest grip . . . eliminating tool slippage and reducing drill breakage. That is why it is preferred the world over for heavy-duty drilling under toughest conditions.

no other is so widely used...

The Jacobs Plain Bearing Chuck is especially designed for portable drills, light- and medium-duty drill presses and lathes. Its high accuracy, rugged construction, tremendous strength and gripping power have made it industry's overwhelming favorite, here and abroad.

See your Industrial Distributor for the complete line of Jacobs Chucks. The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A

JACOBS

IT HOLDS

Backstand Method Saves Time!

Milwaukee Electric Tool Corp. eliminates one complete operation . . . increases production 40% . . . gets better finish on tools!

Problem: The Milwaukee Electric Tool Corp. had a time-consuming method for sanding cast aluminum motor housings for portable electric tools. First they polished with a hard wheel. Then they sanded with a #46 set-up wheel and finished with a grit #100 set-up wheel. This was too long and too costly an operation.

Solution: The Milwaukee Electric Tool Corp. switched from the hard wheel and set-up wheels to the backstand belt for this polishing job.

Result: Now one Armour Backstand Belt does the work of the hard wheel and the #46 set-up wheel—eliminating one operation. A better finish is obtained and production is up 40%!

Manufacturers of hundreds of different industrial and consumer items have proved that the backstand belt method is more efficient and more economical than the set-up wheel.

If you are grinding, polishing or finishing flat or contoured surfaces, cast pieces, stamped pieces or forged pieces, the backstand method can help you with your production problems.

To learn more about advantages of the backstand belt method, write for our free booklet.

We recommend buying through your Industrial Distributor

MAIL THIS COUPON TODAY

Please send me the booklet "Facts about Backstand Belt Grinding and Polishing."

Name .....

Title .....

Firm .....

Address .....

City ..... *Zone* ..... *State* .....

Armour's abrasive belts are only part of a complete line of abrasives built to rigid quality specifications. There are sheets, rolls, discs, and other more specialized shapes.

ARMOUR *Coated Abrasives Division*

SHEETS • ROLLS • BELTS • DISCS

Armour and Company • North Benton Road • Alliance, Ohio

building and by the recent completion of its stores center building.

• **Ford Motor Co.,** Dearborn, Mich., will construct a new $1,500,000 parts depot at North Ave., Melrose Park, Ill.

• **National Cash Register Co.,** Dayton, Ohio, plans a $4,000,000 expenditure for the construction of a six story building to facilitate production on defense contracts. The new building is located at Brown and L Sts., Dayton, and is expected to be completed by the end of the year.

• **Lone Star Steel Co.,** Dallas, will start construction of a completely integrated steel mill adjacent to the firm's present blast furnace, coke ovens and related facilities in East Texas.

• **Reynolds Metals Co.,** Richmond, Va., will build an $80 million aluminum reduction plant at Gregory, Texas.

• **National Malleable & Steel Co.,** will spend $6,300,000 in an expansion program throughout its organization. The largest expenditure will be for a new foundry unit at its main plant in Cleveland.

• **Harnischfeger Corp.,** will soon construct a new factory and office building at Crystal Lake, Ill. The 100,000 sq ft of manufacturing floor space will be for its diesel division, with production slated to start about Oct. 1, this year.

• **Standard Thomson Corp.,** automotive and aviation parts manufacturers, will build a 180,000 sq ft plant at Vandalia, Ohio.

"Hi mom—look what I found—daddy's got a bathtub on his machine!"

McKaig-Hatch Incorporated

"forges" ahead with 8 Smith & Mills Shapers

Shaping hi-chrome tool steel, forging manufacturer notes "time savings and convenience" over 22 years service.

The time saving features of fast return, rapid traverse and the convenient arrangement of controls are among the Smith and Mills Shaper advantages commented upon by this satisfied user of the "Patented Ram" Shaper.

Of a battery of eight shapers in this plant, four are used in making drop forging trimmers from high chrome tool steel. The balance of the shapers are employed in general tool and die work on steels ranging from 18 to 42 Rockwell C.

On heavy duty work such as this, one of these shapers has been in operation more than 22 years . . . three of them for more than 15 years, with no major parts replacement and with a minimum of maintenance.

The speed, versatility and ease of operation of Smith and Mills Shapers will pay in your plant . . . as it does for this noted manufacturer. Available in 10 sizes ranging from 12" to 36" . . . plain or universal types . . . Economy, Standard and Heavy Duty Patterns. For additional details on all the profit features offered by Smith and Mills Shapers, write to Department AM-6.

SMITH & MILLS SHAPERS, Inc.
DIVISION OF HAMILTON THOMAS CORP. HAMILTON, OHIO

NEW SURE-FIRE MONEY SAVER
Try it and see!

Every Dodge Slide-Set Vise you install in your plant has a tremendous money-saving potential. Figure it out yourself:

In the tool and die shop pictured above, each one of 10 skilled employes uses a machinist's vise an average of 30 times a day. With the Dodge Slide-Set they eliminate practically all handle spinning.

50% of the time consumed in clamping their work is saved! The saving in operator fatigue is a plus.

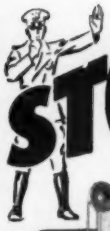
DODGE SLIDE-SET VISE

New, fast, rugged, and revolutionary! **1.** Turning handle counter clock-wise throws vise into "neutral" for fast slide action. **2.** A push closes jaws on work, (or a pull opens). **3.** Turning handle clock-wise applies full pressure conventionally. No-pinch handle protects against blood blisters. Write now for free Bulletin.

DODGE MANUFACTURING CORPORATION
100 Union Street, Mishawaka, Indiana

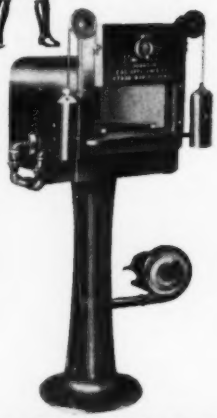
DODGE
of Mishawaka, Ind.

FIRST IN POWER TRANSMISSION MACHINERY



STOP WASTING TIME

Heat Treat High Speed Steels in Your Own Plant with . . . . *Quick Acting* JOHNSON Furnaces



Save time, save gas . . . get the job done without delay with JOHNSON'S Hi-Speed No. 130A. Made in two temperature ranges. Four-burner unit for steels requiring 1400° to 2350° F. Six-burner for 1800° to 2400° F. Temperatures easily regulated with accuracy. Automatic controls available. Powerful burners fire under hearth assuring fast, uniform heat. Brazes carbide tool tips. Hardens small metal parts. Firebox 7" x 13" x 16½". Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower. Write for complete catalog. Johnson Gas Appliance Company 529 E Avenue, N. W., Cedar Rapids, Iowa.

JOHNSON No. 130A Hi-Speed

4-Burner $295.00
6-Burner $325.00
F. O. B. Factory
Also available in smaller sizes

JOHNSON
FURNACES FOR INDUSTRY

C & J *Geared-Head* LATHES
16 INCH
12 SPEED

ONLY ONE MODEL · ONLY ONE SIZE

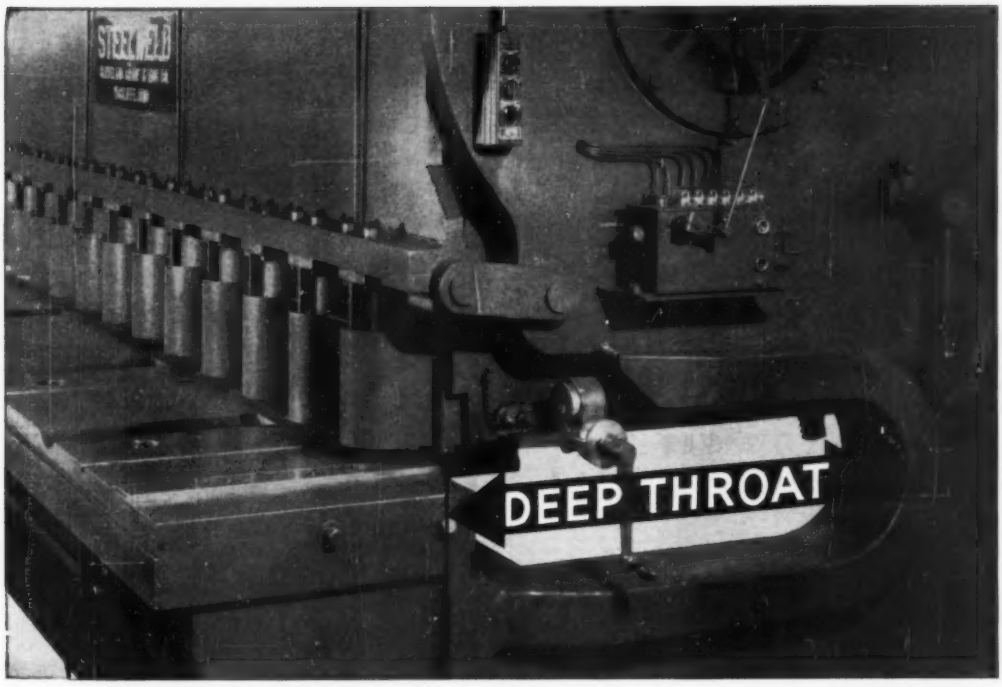
FOR HIGH GRADE PRACTICAL GENERAL SERVICE

- Tooled and equipped for efficient production
- Exceptionally long carriage bearing—23¾ in.
- Feed provided by separate rod—lead screw is used only for thread chasing

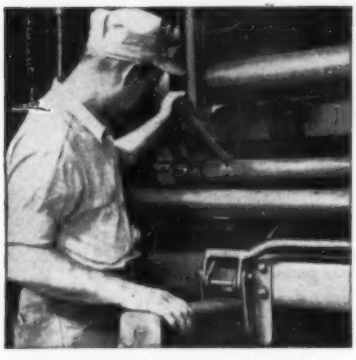
Complete regular equipment includes thread indicator.

Guaranteed accurate to good commercial standards. Write TODAY for new bulletin 38-A-8.

CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO



WIDE SHEETS EASILY SLIT



Steelweld Shears are built for thicknesses of 12 gauge to 1¼ inch and for lengths of 6 to 18 feet.

Throat depths of 18, 24 and 36 inches make it easy to slit wide sheets on Steelweld Pivoted-Blade Shears. Twenty-four inches is the standard throat depth for all but the smallest machines (series 100 is 18 inches). Thirty-six inch throats can be provided as a special feature for many of the larger size machines.

With such deep throats it is possible to slit plates of 36" to 72" wide down the middle for any length.

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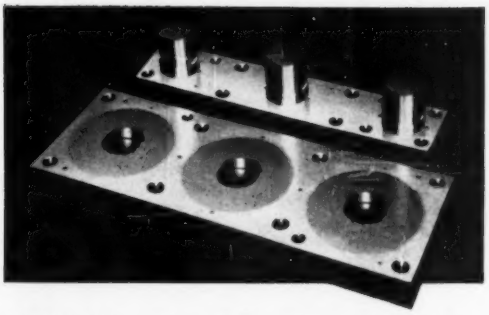

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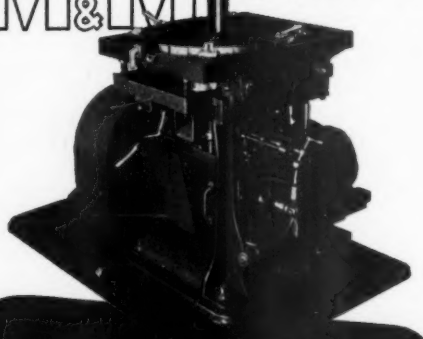

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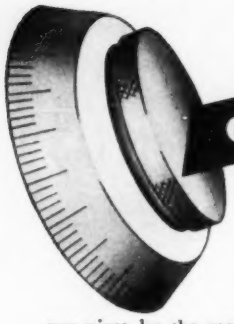

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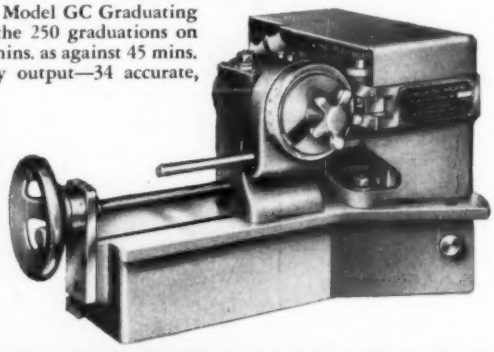

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A Basically Standard Machine Employing Roto-Matic Principle For High Production Special Milling

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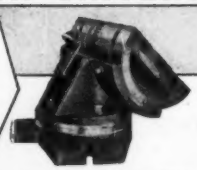

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- Full 3½ h.p. geared-in-head motor engineered with positive drive
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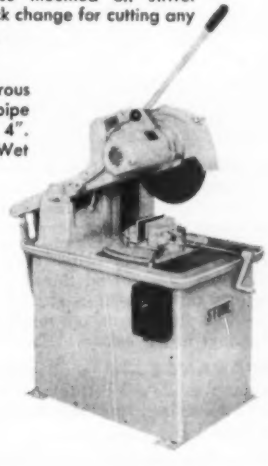

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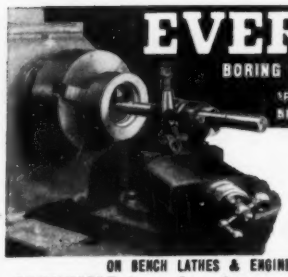

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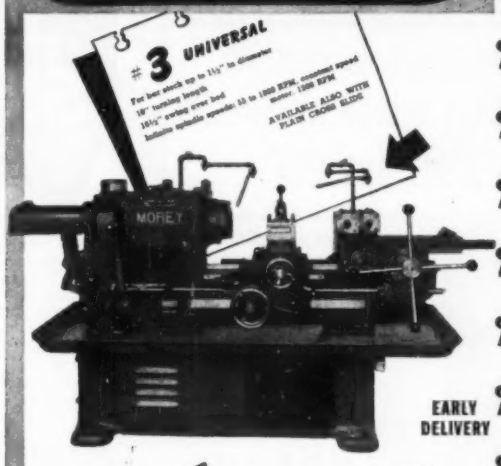

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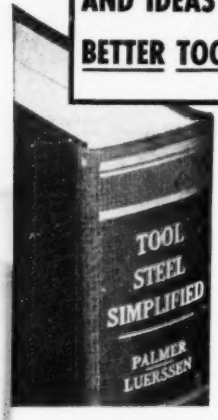

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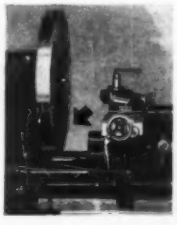

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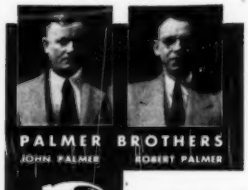

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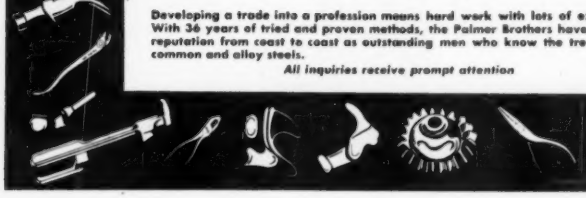

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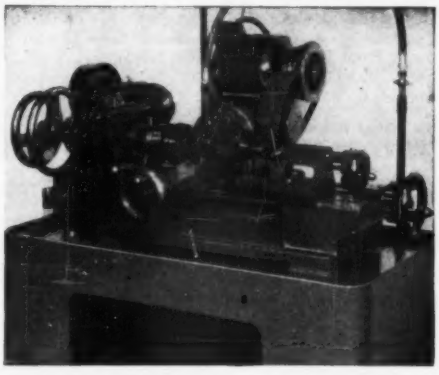

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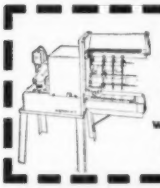

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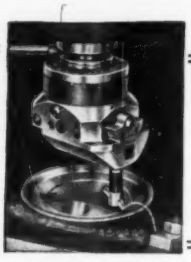

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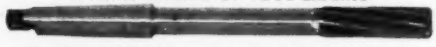

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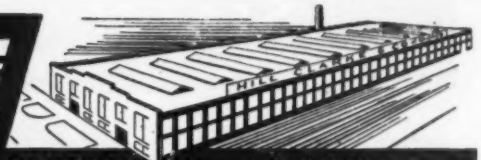

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HENRY & WRIGHT DIEING PRESSES
10 to 100 Ton Cap.
Also Steel Sheets, Strip Steel Coils
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330 W. 42 St., New York 18, N. Y.

WANTED 84" VERTICAL BORING MILL with 220-440, 3 phase AC Motor, Late Model, Good Condition, Well Equipped.

DAVIS MANUFACTURING CO.
P.O. Box 311, Beverly Hills, Calif.
CRestview 6-7551

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Excello—6" Vertical Shell Turning Lathe—Model 724. Must be rough turning machine with 4 turning tools on right hand side and two facing tools on left hand side.

U S. HOFFMAN MACHINERY CORP.
Auburn Division, Auburn, N. Y.
Att: H. A. Kenyon Phone Auburn 3-7317

WANTED
BLISS DOUBLE ACTING TOGGLE PRESS
Size from #4 to #14D. Will consider anything in that range. *Not a dealer.*
W-1052, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED
BLISS DOUBLE ACTING TOGGLE PRESS
Size from #4 to #14D. Will consider anything in that range. *Not a dealer.*
W9764, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

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BAKER 5887

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MACHINERY COMPANY

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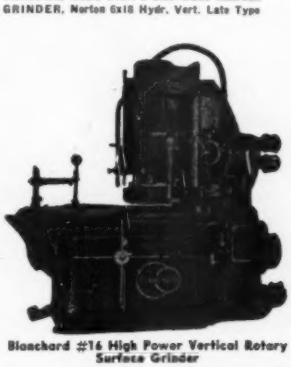
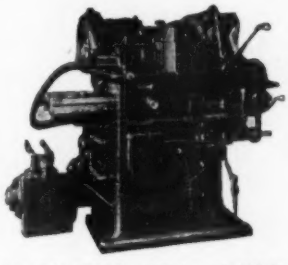
AUTOMATIC, Cleveland #8-1½" Sgl. Spdl.
AUTOMATIC, #9 B & S Auto. Cut-Off 11/16" Cap.
AUTOMATIC, B & S #20, 1". High Speed.
AUTOMATIC, #53 Acme-Gridley 4-Spdl. 1" Cap. Lot of collets, cams, pads, gears. Thrd. spindle and Die Head. 5 h.p. 3/60/220/440 volts.
AUTOMATIC, National-Acme Sgle. Spdl. 4½".
BORING MILL, Colburn 60" Vert. Two Hds.
BORING MILL, Lucas #31 Horiz. 3" Bar.
BORING MILL, Giddings & L #32 Horiz. 3½" Bar.
BORING MILL, Ryerson #11 Horiz. #6 M.T.
BORING MILL, Barrett #2 Horiz. Cyl. Borer, 5".
BORING MILL, King 42" Vertical. A.C. Motor Dr. Power Rapid Traverse to each head.
BORING MILL, #8 Giddings & Lewis, 3¼" Bar. #5 M.T. 220/440 volts.
BOREMATIC, Heald #49 Sgle. End. W/Univ. Fixture, 220/440 volts.
BROACH, Oilgear 10 Tons Horiz. 56" Str. Hydr.
RADIAL DRILL, Foodick 5' Arm. 14" Col. #5 M.T.
RADIAL DRILL, Carlton 4'-15". Motor Dr. on Arm.
DRILL, Radial, 3½"x9" Cinci.-Bickford, A.C., M.D.
DRILL, Radial, Cinci-Bick. 5' Arm. 13" Col. #5 M.T. 24-speed gearbox. 7½ h.p. 3/60/220.
DRILL, Deep Hole, Avey-Draulic #2 Sgle. Spdle.
DRILL, Deep Hole, Pratt Whitney #2 Four Speed Gun Barrel & Tube Drilling Machine. Cap. 72" long, 3" diameter. M. Drive.
DRILL, Baker #316 Hvy. Pattern High Speed Vertical Boring & Drilling Machine, 7½ h.p. 220/440 motor, #5 taper, 12 feeds, 9 speeds, 12¼" throat. 3" capacity in steel.
3—SPDL. DRILL, Edlund #2B, #2 M.T. 16". 9½"
DRILL, Cincinnati 21" Drilling & Tapping.
DRILL, Natco #12 Multiple Spindle Motor Driven. #1 taper, 3 h.p. 220/440 motor. Arranged for 18 spindles. Rectangular head, with Natco 24" Rotary Table.
DISC GRINDER, Besley #285—18" Dble. End Motor Driven. 220/440 volts. Wet or Dry.
GRINDER, Cylindrical, Brown & Sharpe #2 Universal. 220/440 motors.
GRINDER, Hammond #14W Carbide, Dbl. End.
GRINDER, Oakley #3 Univ. Tool & Cutter.
GRINDER, Sellers #1A Hvy. Duty Tool.
GRINDER, G & L #4 Univ. Tool & Cutter.
GRINDER, Heald #25 Surface, 10" Chuck.
GRINDER, Cam, Landis 5"x40" "Type D" Hydraulic Semi-Automatic. New in 1942. Slight use, like new.
GRINDER, Cylindrical, Norton 10"x24" Hydraulic.
GRINDER, Cylindrical, B & Sharpe #4 Univ.
GRINDER, Cylindrical, B & Sharpe #10. 6x18.
GRINDER, Cylindrical, Cinci. 6x18 Hydraulic.
THREAD GRINDER, J & Lamson #TG-615 Automatic. Late Type.
GRINDER, Landis Crankshaft 10x32 Hydraulic.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.
GRINDER, Cincinnati 10"x36" Hydraulic Cylindrical, Filmatic Bearings, 220 volts motors.
GRINDER, Heald #72A-3 Size-Matic Internal.
GRINDER, Norton 6x18 Hydr. Vert. Late Type



Blanchard #16 High Power Vertical Rotary Surface Grinder

PARTIAL LISTING OF LARGEST STOCK IN THIS AREA

GRINDER, Norton 6 x 18 Hydraulic Horiz. Surface.
GRINDER, Pratt Whitney 14x36 Vert.
GRINDER, Springfield #2 Planer Type Surface. 24"x18"x4". A.C. Motor Dr.
GRINDER, Pratt & Whitney 22"x84" Vert.



Greenfield #12 Internal Hydromatic Grinder

GRINDER, Broach, Thompson 6"x48" Automatic Indexing Hydromatic. A.C. Motor Dr.
GRINDER, Cutter, Ingersoll 30".
GRINDER, Tool Cutter, B & S #13 Univ.
GEAR HOBBER, B & S #34 Spur. 10" dia.
GEAR HOBBER, Adams #5 Thread Miller & Spline Gear Hobber. Size 10"x40" A.C. Motor Dr.

Hilles & Jones #8 Pyramid Type Motor Driven Plate Bending Rolls. Size—14'x¾". Top roll —22" dia. Lower rolls—13" dia. Immediate delivery.

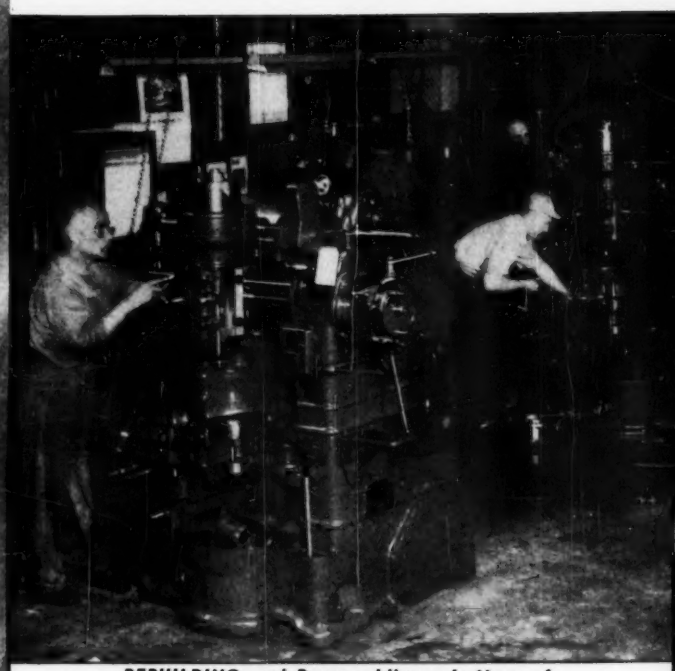
GEAR SHAPER, Fellows #6 High Speed.
GEAR SHAPER, Fellows #72 High Speed.
GEAR SHAPER, Fellows #7 High Speed.
HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 3/16".
LATHE, Pond 36"x108" Grd. Hd. With Equip.
LATHE, 32"x16' Bridgeford Q.C.G. Grd. Hd.
LATHE, Niles 30"x40' Grd. Hd. With Equip.
LATHE, 26"x18' Bridgeford Q.C.G. Grd. Hd.
LATHE, 24"x8' Lodge Shipley, Hvy. Duty.
LATHE, 24"x14' LeBlond Q.C.G. Grd. Hd.
LATHE, 20"x10' American Q.C.G.
LATHE, 20"x10' Hendey Q.C.G. Tapor Att.
LATHE, Reed-Prentice 20"x10' Grd. Hd.
LATHE, 18"x8' Lodge Shipley Q.C.G. Gr. Hd.
LATHE, 18"x18' American Q.C.G. Grd. Hd.
LATHE, 16"x8' American Q.C.G. Grd. Hd.
LATHE, 16"x6' LeBlond Q.C.G. Taper Attach.
LATHE, 16"x6' Lodge Shipley Q.C.G. Grd. Hd.
LATHE, 14"x8' Hendey Q.C.G. Taper Attach.
LATHE, 14"x6' LeBlond Q.C.G. 220 volts.
LATHE, 12"x5' Hendey Q.C.G. Taper Attach.
LATHE, 8"x108" Lo-Swing, M.D., A.C.
LATHES, Turret #4 W & S Univ. 1½".
LATHE, Turret #3A Warner Swasey Univ. Grd. Hd. Bar Feed, Tooling & Collets. a.c. motor.
LATHES, Turret, #2 Simmons Grd. Hd. 1".
LATHE, Turret, W & S #6 Grd. Hd. Ram Type. Bar feed. Motor in Base.
LATHES, TURRET, Gardons & Oliver #1 Electric Bar Feed ¾" cap. Collets, Rd. Sq. Hx. 220 volts.
MILL & SHAPER, Cochrane & Bly #14 Univ. Duplex Vertical. A.C. Motor Drive.

Brown & Sharpe #12 Production Mill

MILL, Planer, Ingersoll 36x42x12. 4 Heads.
MILLING MACHINE, #2 Cinci. Vertical, High Power.
MILLING MACHINE, Vert. #3 Cinci. High Power.
MILLING Machines, Vert. #4 Cinci. High Powr.
MILLING Machine, Horiz. #2, #3, #4, #5 Cinci.
MILLING Machine, Horiz. #3 Kempsmith Univer.
MILLING Machine, Horiz. #4 LeBlond Univ. Hvy.
MILLING Machine, Horiz. #1½ B & Sharpe Univ.
MILLING Machine, Horiz. #2 Kempsmith Univ.
MILLING Machine, Horiz. #2 B & Sharpe Univ.
MILLING Machine, Duplex, Van Norman #2.
MILLING Machine, Prod. #6—6 Cinci. Vertical.
MILLING Machine, Prod. #6—6 Cinci. Auto. Horiz.
MILLING Machine, Prod. #12 B&S 24" Late Type.
MILLING Machine, Horiz. K&T #1B Dble. Overarm. 220/440.
MILLING Machine, Horiz. Nichols Hand Millers.
MILLING Machine, U. S. #MMI-8 Cam Controlled Automatic Horizontal, #40 taper. Late Type. 220/440.
THREAD MILL, Sommer & Adams #20A Boring, Hobbing & Threading Machine. Timken Bearings. Swings 30" over bed. 18" cross feed, 42" longit. Carriage has rapid approach & return. Used to mill internal threads.
THREAD MILLER, Hanson Whitney 4"x9" Univ. Semi-Automatic. 220/440 volts.
THREAD MILLER, Lees Bradner #40A Automatic Chucking. 220/440 v.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, #40 Spdl. Timken Bearing. THY-MO-THOL Control Unit.
PLANER, Gray 30"x30"x10' A.C. Motor Dr.
TAPPER, W & S #1 Sgle. Spdle.
POWER PRESS, Bliss #164 Open Back S.S.S.A.
POWER PRESS, Bliss #3A S.S. Dble. Crank S.A. Grd. 45 tons, 4" stroke, 36"x24" Bed Area.
POWER PRESS — Bliss - Consolidated #163 - B Straight Side Dble. Crank Single Action, 45 tons.
PRESS, V & O #4 O.B.I. 35 tons.
PRESS, V & O #2½ O.B.I. 25 tons.
PRESS, Robinson #5 O.B.I. 80 tons.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Toledo #59½ S.S. 350 ton cap.
PUNCH, Vert. Turret, Hecker 8-Stat. 18" Th. 2" st.
PUNCH, Hilles & Jones #2 Sgle. End. 24" Thr.
PUNCH, Hilles & Jones #5 Sgle. End. 48" Thr.
PUNCH, Hilles & Jones #6, sgle end. 72" Thr.
CUT-OFF SAW, Yates-American #M-90. 220/440.
SAW, Band, Tannewitz #GH-36" High Speed.
SHAPER, Vert., Pratt Whitney #B—6" Motor Dr.
SHAPER—Columbia 32" S.G. Crank.
SHAPER, Morton 36" Draw-Cut, 4-Speed.
SHEAR, Quickwork #A-1 Rotary 60" Throat. 18 ga.
SPRUE CUTTER, Busch Mfw. Bgrd. 50 tons, 2½" cap.

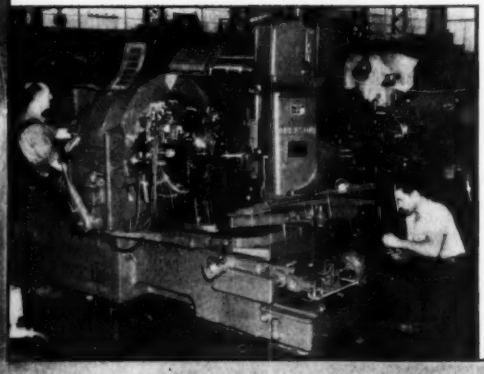
OVER 2000 MACHINE TOOLS AVAILABLE "IN STOCK"

PRECISION REBUILDING··



REBUILDING and Reassembling a battery of GEAR SHAPERS

Hand Scraping in a Slide on Fellows Gear Shaper



Rebuilding Gleason Gear Grinder — Preparing Machine for Final Test

Dismantling Cleveland Automatic Screw Machine for Rebuilding — from the ground up.

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REBUILDERS SINCE 1910

150,000 sq. ft. of floor space

Your present equipment can be REBUILT to NEW-TOOL ACCURACY to meet present-day exacting productivity demands by

AMERICA'S FINEST REBUILDING FACILITIES

In a modern, well-equipped plant, set up *exclusively* to recondition machine tools, with more than 40 years of experience and "know-how" at your service! Our unconditional guarantee eliminates every rebuilding risk.

SPECIAL NOTE TO WAR CONTRACTORS

Should the Government deliver machine tools to you from Government Reserves, our facilities are available to convert the equipment to "new-tool" accuracy.

NOW IS THE TIME . . .

Deliveries on new equipment are very long—Why lose any time when you can put your present equipment into equal-to-new condition and have them in production for you.

A cordial invitation is extended to you to pay us a visit to INSPECT our facilities!

SEND FOR OUR NEW CATALOGUE AVAILABLE ON REQUEST

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CABLE ADDRESS: WOODWORK, N.Y.

This same photo [illegible] the zone of tolerance.

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

3-1/16" Model A Cleveland. 1942.
20"x25" Fay Automatic. 1942.
No. 3-S Ceco ⅜" Cap. 1942.

DRILLS

No. 4BM Fosdick. 1942.
No. 2 LMS Leland Gifford Hyd. 1942.

GEAR EQUIPMENT

No. 645A3 & 61A Fellows Gear Shaper. 1944.
No. 6 Gleason Revacycle. 1940.
No. 6 Gleason Gear Tester. 1942.
8" Red Ring Internal Shaver. 1942.
15" Red Ring Lapper. 1942.
Red Ring Universal Tester. 1942.

GRINDERS, CYLINDRICAL

14"x168" Norton Plain Type C. 1942.
14"x48" Norton Pl. Type C. Hyd. 1941.
14"x36" Landis Univ. Type C. Hyd. 1942.
12"x30" Norton Universal. 1941.
10"x18" Norton Type C Plain. 1942.

GRINDERS—INTERNAL

No. 24-36 Bryant. 1943.
No. 16 CP 16 Bryant. 1942.
No. 16-16 Bryant. 1942.
No. 172 Heald Hyd. Gap. 1940.
No. 81 Heald Plain Hyd. 1940.
72A3 Heald Plain Hyd. 1942.
No. 50 Heald Hyd. 1943.

GRINDERS—THREAD

No. 35L Excello Precision. 1943.
No. 31 Excello Precision. 1940.

GUN BARREL MACHINES

No. ⅛B x 50 P&W Reamer. 1942.
No. ⅛Bx30 P&W Reamer. 1942.
No. ⅛B x 50 P&W Rifler. 1942.

LATHES—ENGINE

20"x240" LeBlond. 1941.
20"x72" Reed-Prentice. 1942.

LATHES—PRODUCTION

No. 4D Potter & Johnston/ 1941.
No. 12 Gisholt Hydraulic. 1943.
No. 10 Sundstrand Automatic. 1943.
No. 3 FU Foster "Fastermatic". 1942.
14"x42" Monarch "Magnamatic". 1941.
Lipe Carbo-Matic. 1942.
LeBlond Multi-Cut. Late.
No. 4-14 Lo-Swing. 1941.

LATHES, TURRET

No. 3 Gisholt Universal. 1942.
No. 5 Gisholt Universal. 1942.
No. 4 AR Libby Universal. 1942.
No. 2 W & S Simplified. 1941.

MILLS, PRODUCTION

No. 34-36 Cincinnati Hydro. 1942.
No. 2-26 Kent Owens. 1942.
No. 1-14 Kent Owens Hyd. 1942.

MILLS, THREAD

6"x6" LT Lees Bradner. 1942.

MISCELLANEOUS

48"x½" Niles Plate Straightener.
No. 616 Cleveland Rigidturner. 1942.

SHAPERS

20" Cincinnati Plain. Late.
0" Pratt & Whitney Vertical. 1942.

Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. . . Indianapolis, Indiana

ANGLE ROLLS, 2"x2"x½" N. & W., '42
AUTOMATIC, #2G Brown & Sharpe, 1¼" 1942
BOLT THREADER, 1½" Williams Reliance
BORING MILL, 100" Cinci. Massive, 2 Hds., M.D.
BORING MILLS, 3½" & 4" bar Landis Floor (3)
4½" bar Niles table, Dual Control, 3" bar Univ.
BORE-HONE, Barnes, 10 stroke, 9" bore, '42
BRASS LATHE, 21" Acme, Late, Hardened Ways
DRILL, 25" Walpel, Tapping, M.D.
GEAR GENERATOR, 3" Gleason, Late
GEAR HOBBER, 36H Gould & Eberhardt
GEAR HOBBER, #12 Barber Coleman
GEAR PLANER, "11" Rieneckar, Bevel
GEAR SHAPER, No. 75 Fellows High Speed
61A, 64 & 84A, 6 Fellows
GRINDERS, 29"x120" Landis, Cyl., Hyd., AC
GRINDER, 10"x48" Cinc. Cyl., M.D.
GRINDER, No. 6-T Sellers, Tool, '42
GRINDER, No. 16V2B Bryant, Int., 1945
GRINDER, No. 174 Heald Gap, Int. 54" sw., '42
GRINDER, No. 72AS Heald Internal, 1943
GRINDER, No. 75A Heald, Int. Hand Feed
GRINDER, Micro-Internal, Large
GRINDER, SURFACE, 13"x48" Hancott Vert. Spin; No. 16 Blanchard, 28" Chuck
GRINDER, UNIV. 12"x30" Thompson M.D.
GRINDERS, UNIV., No. 1 B. & S., 1945
LATHES, 36"x15' Con. Niles, blanks to 98", M.D.
48"x20'6" cen. Simmons, like new, '42
LATHE, 42"x31' cen. Putnam Grd. Hd.
32"x25' cen. Sommerfeld, 2 T.A., 2 carr., '42
22"x24¾"x48" cen. Skoda, New
20"x48" cen. American, T.A., (2)
14"x6' Hendey T.A., M. in base
TAPPERS, Nos. 1 & 2 Bakewell (4)
TURRET LA., 20" Libby "C" 4½" capty.
No. 1B Foster Univ., 2" capty. (2)
No. 2B Foster Univ. 3¼" capty. Bar.
RIGID-MIL, 96" Sundstrand, Tbls. 30"x120"
THREAD MILLER, 12"x60" Morey Shields, '42
MILLER, UNIV., No. 2A B. & S., M. in base.
Timken Nos. 2 & 3 Cinci. Pl. Cone Motorized
MILLERS, HORIZ. No. 4 Cinci. High Power, M.D.
MILLER, HORIZ., No. 2 Stand. K.&T., M-in-base
MULTIMATIC, 7" Model J-S spindle
PIPE THREADER, 2" Landis, AC, M.D.
PLANER, 48"x96"x8' Cinci. 4 Hd., Box, PRT. Force Feed
RADIAL DRILL, 6'10" col. Amer. Trip. Purp. M.D.
SHAPER, 32" Cinci. Gear Box M.D.
SHAPERS, 24", 20" & 18" G. & E., AC, M.D.
22" & 18" Hercules, Univ., New
30" Morton, Draw-Cut M.D.
SLOTTERS, 20"—24" & 10"—12" Dills, M.D.

BENNETT MACHINERY CO.
375 Allwood Road, Clifton, N. J.
Off Route 5-3, Phone Prescott 9-8996

These advertisements

are current, live opportunities in the metal-working field.

Each advertisement represents a current Want or Offering of an organization or individual in this field, with some element of profit in each for whoever can fill the need. Some have money-saving possibilities, others are opportunities for more business; many are employment opportunities; still others offer property, or equipment used or surplus new equipment.

"Searchlight" advertisements are constantly changing. New opportunities are finding their way into this great Want medium each issue. Regular consultation of the "Searchlight" pages can be as important to you as reading the text pages of each issue; Text matter is news of progress and development in the industry, "Searchlight" advertising is news of current "Opportunities" in this industry.

for EVERY business WANT
"Think SEARCHLIGHT first"

SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Bullard 24", VTL New Era
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 0, 3" cap.
Giddings & Lewis No. 32, 3¾" cap.
King 42" Vert. 2 rail heads
Niles-Bement-Pond 4" Bar
Niles-Bement-Pond 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS

Bausch Radial Drill & Tapper
American 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x13" col.
Walker-Turner Radial. 2½'
Leland Gifford 2LMS

ENGRAVERS

Auto Engravers Bench Type
Deckel GK2 Type 3 Dimensional, New
Gorton #1A 2 Dimensional
Gorton #3B 3 Dimensional
Gorton ME, 3U

GEAR EQUIPMENT

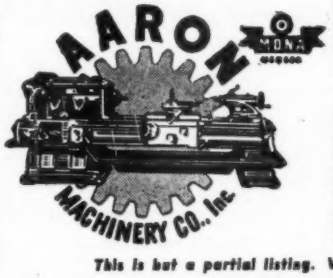
Barber-Colman Type "S" Hobber
Barber-Colman #12 Hobber (2)
Brown & Sharpe #13 Cutter
Fellows High Speed Shapers 712, 72, 725, 71
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Red Ring Lapper, Shaver
Schuchardt & Schutte #1 Hobber
Fellows #20M Redliner

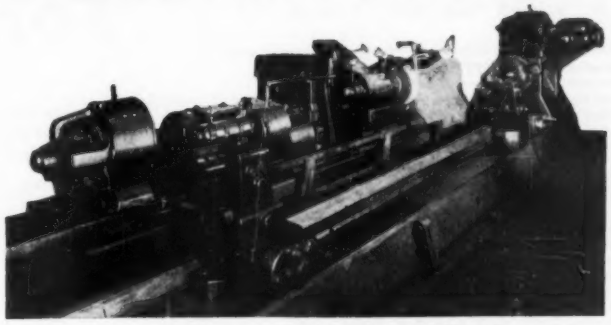
GRINDERS, MISCELLANEOUS

Bryant #5
Cinn. 12x48" Univ.
Covel #91A Univ. Tool & Cutter, Hammond #4
Grenby Int. 1G-12, G2
Heald #73 Internal centerless
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 12"x36" Univ., Latest
Landis 6"x30" Type C Cyl.
Majestic Internal
Norton 6"x18", 6"x30", 10"x18" Type C cyl.
Norton 14"x48" Type C Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer, Sellers 4G, Black Diamond
Port Cable Belt WGB, G8 Granby Int.
Pratt & Whitney Radius #R6, K.O. Lee Tool
Wicaco Internal

GRINDERS, SURFACE

Abrasive 3B 8x24", #33, #34 Vert.
Blanchard #16, 30" Mag. Chuck
Brown & Sharpe #2
G & L #45 12"x24" Hyd. Feed, #5, 10"x36"
Heald 22—12" chuck, Arter 12"
Norton 6"x18" Hyd.
Norton 10"x36" Hyd.
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base
Thompson Hyd. 6x12x18"





Norton Roll Grinder 50" x 28' (actual photo)

LATHES

Lodge & Shipley #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Henday 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Lipe-Carbo
Monarch 10"x20" EE Latest (5)
Monarch 12"x30" CKK Late (2)
Putnam 36"x22'
Putnam 42"x17'
Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head
Sundstrand 8x15"x15" Stub

MILLS, PLAIN, UNIVERSAL & PROD.

Archdale Plain, English Make
Brown & Sharpe #000, 21
Burke #4 Plain & Univ. Vert. Hd.
Cinn. 2MH Univ. Vert. Attach
Cinn. 08 PL—Rise & Fall
Cincinnati, 1 M Univ. #2 Dial Type
K. & T. 2HL Plain
Kent Owens 1V, 1M
Sundstrand 00, Rigidmil
118 Van Norman, Prod.
6"x20" P&W Thread Mill

MILLS, VERTICAL

Archdale Vert. 15" Rot. Table
Brown & Sharpe #3 single pulley drive
Cincinnati #4, 08 Vert. #2, 3, SPD
Morey #12M Profiler, 2 sp.

PRESSES

Bliss 304A 4" Str.
Bliss 645, 650 Hi-Production Presses
Bliss 18, OBI, 58, 62, 162 OB.
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, SS
Bliss 31½A Double Action Toggle
Ferracute EG54, 400 Ton Knuckle
Niagara Herring, 15 Ton
Niagara A1¾, O.B.I.
Toledo 400 Ton Knuckle Joint #663
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing

TURRET LATHES

Acme 6W Fox 2 9/16" Cap.
Brown & Sharpe, #1, 2 Hand, #10, 11
Denver, 6, 2" Shell Turret (3)
Foster #3B 4½" Cap.
Gisholt 2L, #4 Bar, Feed, Late.
Jones & Lamson 2½" Saddle Univ. Late
Libby #4R 2" Cap. Univ. Late
Libby 1H5 Univ. Saddle
Morey #4 Univ. Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, 2A
Warner & Swasey G.H. #5 Univ.

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

500 ton Shaft Straightener 24' Long Bed. Watson Stillman
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
80 Ton Wilson Press, 51"x24" Platen, 11½" St. 13" opening
50 Ton William & White, 20" St. 54"x 20" Bed—24" opening
35 Ton Oil Gear Straightener
50 Ton Stokes Molding Press

MISCELLANEOUS PRESSES

550 Ton Southwark, 42"x32" Platen 28" St. 48" opening
300 Ton Watson Stillman 24x20" Platen 11" St. 21" opening

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MISCELLANEOUS

Automatic, Cleveland Model B 1 1/16"
Automatic B & S #00G
Automatic 4 Sp. 1½ Conomatic
Band Saw: DoAll Zephyr 36"
Band Saw: #8 Marvel
Filers—DoAll Band Filer
Filers—Greb Band Filer
Hacksaw: Marvel #6, #9; Peerless 6"x6"
Honer: Micromatic #H-1
Keyseater: Davis, Baker, M & M
Shapers: 24" Rockford, 24" Chci., 28" Gould & Eberhardt. Many Others
Tappers: #1 Bakewell, #3C Haskins
Welder: 50 KVA Elsler Air Operated
Welder: Taylor-Winfield 50 KVA H1-Wave

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62" Niles Bement Pond, 2 heads, PRT, M.D.

44" Bullard "Maxi-Mill", 2 heads, PRT, M.D.

Abrasive Cutoff, #213 Campbell, 7½ H.P., late.
Automatic, #0G Brown & Sharpe, M. in base.
Bending Roll, 8' x ½" Newbold, pinch, all steel, 1940.
Boring Mill, 60 Gisholt, vertical, 2 hds.
Boring Mill, 44" Bullard Maxi-Mill, Vert. PRT, M.D.
Boring Mill, #0 Giddings & Lewis 3" horiz.
Boring Mill, 3½" N-B-P, horiz. table type.
Drill, 4 spindle, #2 KH Allen, ½" chucks, late.
Drill, 3 spindle, #2MS Leland Gifford, Mtr. Spdles.
Drill, Radial, 6' N-B-P "Rightline" M. on arm.
Drill, Radial, 6' Dreses, gear box, M.D.
Drill, Radial, 8' Western, gear box, M.D.
Drill, Upright, #221½ Barnes, 700 RPM, 1942.
Drill, Multiple, 45 sp. #2 Baush hydraulic.
Gear Hobber, #36H Gould & Eberhardt univ.
Gear Lapper, Type 10LS Fellows, 1942.
Grinder, Cylindrical, #5 B & S, 3"x18", 1942.
Grinder, Surface, 6" x 18" Norton, hydraul., 1942
Grinder, Surface, 8" x 54" Thompson, M.D.
Grinder, Surface, #34 Abrasive Vert., '41.
Grinder, #5 Bryant, internal, late.
Lathes, Duomatic, #3A Lodge & Shipley, 171" c.c., double carriage 1942.

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Lathe, 36" x 30' Putnam, grd. hd., M.D.
Lathe, 24" x 9' c.c. Reed-Prentice, grd. hd.
Lathe, 16" x 8' American, taper, M. in base.
Lathe, Automatic, 12" x 24" Lipe-Carbo.
Lathe, Production, 8"x60" Lo-Swing, late.
Miller, Production, #1-12 Cincinnati, 1942
Miller, Universal, #4 Cincinnati, Hi-Power, M.D.
Miller, Plain, #1½ B Milwaukee, M.D.
Miller, Vertical, #14 Cochrane Bly, slot. attach.
Planer, 36" x 36" x 12' Cincinnati, 2 hds., M.D.
Tapper, #11 Warner & Swasey, 1945.
Turret Lathe, #2G Morey, bar, collets, 1942.
Turret Lathe, #2 Bardon & Oliver, 1943.
Welder, 50 KVA Acme air-press, spot, timer, late.

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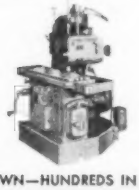

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FELLOWS: 64A Shaper, 18" dia. capacity
FELLOWS: 7 Shaper, 7" dia. capacity
FELLOWS: 72 Shaper, 7" dia. capacity
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CINCINNATI: 10"x36" Hydraulic, plain
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VAN NORMAN: #666 Crankshaft Regrinder
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NORTON: 10"x18" 45° angle wheel head

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BRYANT: 112 Universal, Hydraulic
BRYANT: 16C16 Hole, Hydraulic
HEALD: 70A Plain
HEALD: 72A3, 72A5 Plain and Univ.
HEALD: 72A3 Sizematic Centerless
HEALD: 72A5 T-bed, Universal

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VAN NORMAN: No. 73, 639, 649
VAN NORMAN: No. 3½ Universal

GRINDERS—SURFACE

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ARTER: A-3—12" Rotary
THOMPSON: 6"x12"x18" Type B
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck
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EXCELLO: No. 33 external, dia. 6"x18" centers
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NORTON: 2F x 40" Diameter
SCHRANER: Model A External Cylindrical Lapper—8 heads

LATHES—PRODUCTION

LIPE-ROLLWAY: 12"x30" Carbomatic, hydraulic feed
LODGE & SHIPLEY: No. 3A Duomatic
MICHIGAN: #1708 and 1712 Relieving
MONARCH: 24"x60" Geared Head
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WILLSON: 15"x48" Geared Head Motor Driven (New)

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CINCINNATI: 56-96 Hydromatic
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VAN NORMAN: Contour Miller 10CT

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LEES-BRADNER: 40A Thread Miller
MOREY: 12"x60" Thread Miller
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PRODUCTO: Hand Tapper

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OLIVER: 10" Tool Bit-Template
FELLOWS: Flat Top Helical Gear Cutter
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), Automatic Indexing
WALKER-TURNER: Bench Grinder, ½ HP

MISCELLANEOUS

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CUT-OFF: Campbell, Abrasive 425 Cutalator, 4½" dia. capacity
CUT-OFF: Pipe & Tube, 10" Williams
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14"x6' bed Handey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Prentice, m.d., taper
14"x8' Pratt & Whitney, cone
14"x8' Sidney Geared Head, m.d.
15"x6' LeBlond Geared Head, m.d.
16"x36" Pratt & Whitney Geared Head, m.d.
16"x58" centers Pratt & Whitney, cone motorized
16"x6' Bradford, cone
16"x6' Handey Geared Head, m.d.
16"x6' Handey Yoke Head, taper
16"x6' LeBlond, cone
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x6' Lodge & Shipley, cone
16"x6' bed Monarch Geared Head, m.d.
16"x8' Lodge & Shipley Geared Head, m.d. in leg, taper
16"x8' Sebastian, cone
17"x6' LeBlond Geared Head, m.d.
18"x48" centers Lodge & Shipley, m.d., taper
18"x5' LeBlond Geared Head, m.d.
18"x6' bed Lodge & Shipley, cone, motorized
18"x6' Monarch Geared Head, m.d.
18"x6'6" Greaves-Klusman Geared Head, m.d. in leg
18"x7' Handey Geared Head, m.d., taper
18"x8' American Geared Head, m.d.
18"x8' bed Baye & Emmes, m.d., taper
18"x8' Handey Geared Head, m.d.
18"x8' Lodge & Shipley Selec. Head, m.d.
18"x8' Lodge & Shipley, cone
18"x8' Champion, cone
18"x8' Whitcomb-Blaisdell Geared Head
18"x10' Bradford, cone, motorized
18"x10' Greaves-Klusman, cone, motorized
18"x20' Monarch Geared Head, m.d. in leg
19"x8' LeBlond, cone
19"x8' bed LeBlond Geared Head, m.d.
20"x8' bed American Geared Head, m.d., taper
20"x8' Cisco, cone
20"x8' bed Greaves-Klusman Geared Head, m.d. in leg
20"x10' bed Lodge & Shipley Geared Head, m.d.
20"x10' Sidney Geared Head, m.d.
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
22"x10'6" Greaves-Klusman, cone, motorized
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Lodge & Shipley, cone
24"x12' Bridgeford Geared Head, m.d., taper
24"x12' LeBlond, cone
24"x18' Lodge & Shipley Selective Head, m.d.
25"x10' LeBlond, cone
26"x8' Bridgeford Geared Head, m.d.
27"x10' centers American Geared Head, m.d., taper
30"x12'6" Niles-Bement-Pond, m.d., taper
30"x12'6" Niles-Bement-Pond, m.d., taper
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McDonald No. 31 O.B.I. Press
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No. 162 Bliss Straight Side Gap Frame Dial Feed Cartridge Press (2)
Ferracute Model DDG-55 Press
No. 75-½ Bliss Straight Side Single Crank Trimming Press
No. 59 Niagara Straight Side Single Crank Press

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1" National Wedge Grip Bolt Header & Upsetter
5" National Upsetting & Forging Machine
2" National High Duty Upsetting & Forging Mach.
2000 lb. Steam Drop Hammer
1500 lb. Steam Drop Hammer
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¾" Acme Upsetter
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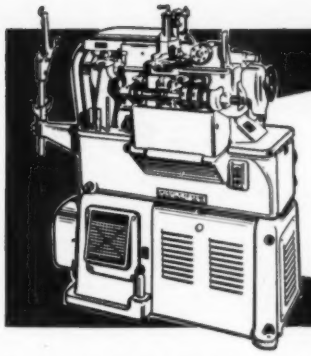

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Beaver-Bilt Brown & Sharpe machines are *unconditionally guaranteed* to produce work to the same tolerances as new machines. Only genuine B & S replacement parts are used and no change is made from standard.

The following late type, high speed Brown & Sharpe automatic screw machines are now in stock for immediate delivery . . .

3—No. 00G H.S. Serial Nos. 15163, 15907, 16851 (1943); Swing Stop, Vertical Cutoff Slide, ½" Spindle Cap., 6000 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

2—No. 00G H.S. Serial Nos. 18414 and 18783 (1945); Swing Stop, Vertical Cutoff Slide, ½" Spindle Cap., 6000 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

12—No. 0G H.S. Serial Nos. 10298, 10858, 10859, 10861 (1943); 11383, 11385, 11584, 11751 (1944); 12563, 12656 (1945); 13115, 13466 (1946); Swing Stop, Vertical Cutoff Slide, ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

3—No. 2G H.S. Serial Nos. 10638, 11651, 11842 (1944); Swing Stop, Vertical Cutoff Slide, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, Motor in base. Beaver-Bilt.

TRADE-IN SPECIALS IN GOOD OPERATING CONDITION AT A FRACTION OF ORIGINAL COST

4—No. 00G	High Speed B. & S. Automatic Screw Threading Machines Serial Nos. 16024, 16025, 18532, and 18533 with Screw Slotting Attachments and Motors in base. These machines are in excellent operating condition.
6—No. 00	High Speed B. & S. Automatic Screw Machines Serial Nos. 10760, 10762, 10763, 10765, 10770, and 10824, complete with Turner Motor Drives. These machines are in excellent operating condition.
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1—No. 0	Standard B. & S. Automatic Turret Forming Screw Machine Serial No. 5698 complete with Motor Drive.
1—No. 0	High Speed B. & S. Automatic Screw Machine Serial No. 8412 with New Drive-All Motor Drive. This machine is in excellent operating condition.
1—No. 0G	High Speed B. & S. Automatic Screw Machine Serial No. 7812 complete with Vertical Cutoff Slide and Motor in Base. In excellent operating condition.
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3—Hardinge Second Operation Machines, Bench Type (less Bench) with Hand Lever Opening and Closing Collet Type Bronze Bearing Headstock (less Collets) Serial No. 1755, 9/16" Collet Cap. mounted on a 30" Length Bed. There are not any cross slides or turret slides with these machines. Also, less any motor drive.
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1—No. 1C Haskins High Speed Production Tapping Machine. New 1944, excellent condition.

1—Elgin Precision Bench Lathe 7"x15" Cap., complete with Hardinge Ball Bearing Spindle Headstock, 3 Jaw Universal Chuck, Compound, Tailstock, Milling and Grinding attachments mounted on a 6 foot Maple Bench with Motor Drive.
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1—De Laval 2 Bushel Oil Separator Serial No. 8912 complete with motor drive.
Price $850.00

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1—No. 12 Brown & Sharpe Plain Production Type Milling Machine Serial No. 4426 with electric push-button controls. New in 1944.

4—Delta 14" Floor Type Pedestal Drill Presses complete with Chucks and motors. New in 1945 and in excellent condition.

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1—Hendey Toolroom Lathe 12" x 6' Serial No. 28040 with Geared Head and motor in base. Collet Attachment, Taper Attachment, Chuck, Dog Plate, Face Plate, Collets and Tailstock.

BEAVER UNCONDITIONAL GUARANTEE

Any Beaver-Bilt or "as is" machine sold by us can be operated in your own shop for a period of 30 days and, if found unsatisfactory for any reason whatsoever, may be returned freight prepaid for a full refund of the purchase price.

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36"x24', Internal Face Plate, geared head, Rebuilt
30"x32', 12 speed head
30"x12', Geared head
24"x8', geared head
18"x8', geared head
18"x8', 3 SCD bowl head, back geared
18"x6', Geared head
16"x8', High Duty, 3 SCD
16"x8', 3 SCD, Bowl head type
16"x6', High Duty, Cullman Drive

LODGE & SHIPLEY

27"x30', Lodge & Shipley, geared head
27"x18', Patent head
27"x14', 9" hollow spindle
24"x12', Selective geared head
20"x10', 5 SCD
20"x8', geared head
18"x9', Bowl head type, 3 SCD
18"x8', 5 SCD, single back geared
18"x6', Selective geared head
14"x6', 3 SCD, double back geared
14"x5', 5 SCD

LeBLOND

25"x12', heavy duty
24"x10', 3 SCD, double back geared
21"x8', 3 SCD, double back geared
17"x6', 3 SCD, double back geared
14"x6', 4 SCD, single back geared
#6 Multi Cut, swings 9"

HENDEY

18"x8', 4 SCD
14"x6', Model EBM geared leg
14"x5', 4 SCD, Yoke head type, drive all drive
14"x6', 4 SCD, Yoke head type

MONARCH

16"x8', 3 SCD, double back geared
16"x6', Motor on leg type
14"x6', 3 SCD, double geared

BOYE & EMMES

20"x8', 3 SCD, double back geared
18"x8', 3 SCD, double wall apron

MISCELLANEOUS LATHES

Bullard 36", 4 chuck jaws, side head, motor driven
Landis 10x24 Type "C" Univ., LATE TYPE
Gardner 24—53° Horiz. Disc Grinder
Micro Model FG Grinder
Bryant #3 Hole Grinder
Heald #78 Centerless Grinder

Three—Cincinnati 6 x 18 Cylindrical Grinders, Model ER, NEW 1943, Complete with Infeed and preciprocator attachment.

Style D Planetary Miller
Cincinnati #1-12, Plain Miller, NEW 1942
Libby Geared Head Turret Lathe, 24" swing, 4½" hole, 6 position turret, 4 jaw chuck
Oster Turret Lathe
Niles Planer 44x44x14', box table, 2 rail and side heads, power elevation, 24" center to center of Vees
Gray 60x60x14', 2 rail and 2 side heads, power elevation
Gray 32x32x8', 1 rail head, hand elevation, cord housing
Sterling 16", Shaper, motor drive thru gear box, with vise
Gray 42x42x12' 2 rail heads and 2 side heads, power elevation, Planer
LeBlond 30"x14' center distance, Engine Lathe

BORING MILLS—VERTICAL

King 34", Turret head, self contained, 3 SCD, 12 speed
Colburn 54", Two heads on rail

BORING MILLS—HORIZONTAL

Universal 3½" bar, 16 speed
Cleveland #1, 2½" bar, single pulley drive
Barnes #3, 3" bar

MILLERS—PRODUCTION

Ingersoll 42x36x12', 4 head adjustable rail
Ohio 40" Tilted Rotary Miller

MILLERS—PLAIN

Cincinnati #3, 3 SCD, double back geared, single round overarm
Cincinnati #4 Hi Powered, single pulley drive, single round overarm
Brown & Sharpe #5B, single pulley drive, single round overarm

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Automatics: ⅞" and 2" Cleveland, Model A
Automatic: No. 00G Brown & Sharpe, Serial No. 7132
Automatic: 1" Model C, 5 Spindle Acme, MD
Auto Chucker: 8½"x8" G. & Del. 4-Sp. Tool Rotating
Boring Mill: 3¾" Barrett Horizontal MD
Dieing Press: 25-Ton Henry & Wright, 1½" Stroke, 1942
Drill Press: No. 262 Barnes, All Geared, Tapping, 1942
Drill Press: Avey No. MA-2, Single Spindle, 1941
Drill Press: 4-Spindle Kingsbury, Vertical, Burring Att.
Grinder: Sterling Univ. Tool & Cutter, 1944
Grinder: No. 72A-5 Heald Plain Internal, Late
Lathe: 12"x54" LeBlond Heavy Duty, 1943
Mill: No. 0 Brown & Sharpe Omniversal, 1940
Mill: No. 1 U. S. Hand, MD, 1944
Mill: No. 000 Brown & Sharpe Electric Prod. (3), Late
Mill: No. 5B Heavy Brown & Sharpe Plain, MD
Oil Separator: Barrett-National, 1 Bushel, 1937
Shaper: 36" American, Heavy Duty, V-Ram, MD
Turret Lathe: No. 2-G Morey, 1" Bar, 1942
Turret Lathe: No. 2 W. & S., Ser. No. 580373, Elec. Bar Feed
Turret Lathe: No. 3-A Warner & Swasey, Ser. 100,000 (2)

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LEBLOND #2 Gun Boring Lathe (1942 vintage)—used on 37 MM shells—swing over bed 18½"—hole thru spindle 5½"—10' stroke—excellent condition.

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SENECA FALLS 6"x108" ctrs. Lo-Swing Lathe—late type.

NILES 60"x28' Geared Head Engine Lathe—15' ctrs., MD.

TURRET LATHES

WARNER & SWASEY #2A Timken bearing—chucking—cap. 3½".

WARNER & SWASEY #4 Universal Ram Type Pan Bed, MD—1½" capacity—bar feed—Timken bearings.

GISHOLT #3L Universal—4⅝" capacity—arranged for chucking.

WARNER & SWASEY #5 Pre-Selector Head—arranged for bar & chucking, 750,000 Serial No.

BULLARD 24" "New Era" type—vertical, 3-Jaw—side head.

UNIVERSAL MILLERS

BROWN & SHARPE #3A Constant speed, MD—with dividing heads—attachments—range 34"x12"x 19".

INDUMA #2A Automatic Universal Miller, 24"x 9"x17"—Vertical head, tbl. 40"x10", universal dividing head—motor-in-base, NEW.

VERTICAL MILLERS

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CINCINNATI #3 Hi-Power Vertical Miller—tbl. wkg. surface 55⅛"x13½"—range long. 34", cross 13", vert. 14"—rapid traverse.

BROWN & SHARPE #2, 28"x12"x14"—tbl. wkg. sur. 54¼"x14", MD, rapid traverse.

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FRANKLIN 4¼" Bar; table type; M.D.
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NILES 8" bar floor type; motor drive

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BULLARD 24" Power Rapid Traverse
BULLARD 16" 6-spindle "A" Mult-automatic; M.D.
NILES 100"; 2 swivel heads; P.R.T.; D.C. M.D.
NILES-BEMENT-POND 144"; heavy duty; M.D.

BROACHES
AMERICAN Mod 6-G Hydr. Rifle Broach
CINCINNATI 1-30 Duplex Vert. Hydr.

CRANES
MILWAUKEE 5-ton; spans, 22'2"; 24'; 25'; 36'11"; 37'2"
MILWAUKEE 10-ton; span, 36'
MILWAUKEE 25-ton; span, 34'4"

DRILLS—Miscellaneous
BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; Inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle; Camel Back; Late
BARNES 24" all geared; Camel Back; M.D.
BAUSH 1⅛x30" Deep Hole; Late
EDLUND 2B, 3-spindle; 1⅜" Dia.
FOOTE-BURT (Sipp) 3-12-1 1-spindle; 2½"
FOOTE-BURT 20-spindle mult.; M.D. Late
LELAND & GIFFORD #2 2-spindle; 1⅛" dia.; M.D. Late
MOLINE 6-spindle Multiple Hole-Hog; 3¾" dia.; M.D.
NATCO 2BL Mult.; Holesteel; PRT; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.
NATCO D-5 Multiple; adjustable; Late
BODINE #42-20 multi-univ., dial feed; M.D.

RADIAL DRILLS
AMERICAN 6'16" Triple Purpose; M.D.
CINCINNATI BICKFORD 6'15" Univ.; M.D.
DRESES 4'13"; M.D.
DRESES 5'15" Universal; M.D.
NILES-BEMENT-POND 6'15"; S.P.D.

GEAR CUTTING EQUIPMENT
BROWN & SHARPE #-72" Auto. Cutter; M.D.
BILGRAM 6" & 8" cap. Bevel Gear Gen.; M.D.
CROSS No. 1 Tooth Rounder; M.D.
FELLOWS Nos. 61A, 6Z2, 715, 75, 7, 7A, 75, 72, 77 High Speed Gear Shapers; late
FELLOWS 8-M Red-Liner; M.D.; Late
FELLOWS 12-M Involute Meas. Instr.; Late
FELLOWS 13-LS Lapper; late
GLEASON 3" & 12" Straight Bevel Gen.; late
GLEASON 10", 11" & 18" Bevel Gear Gen.
GLEASON 24", 37", 77", 96" Bevel Gear Planers; M.D.
GLEASON No. 14 Hypoid Grinder; late
PRATT & WHITNEY 10" Gear Grinder; late
BROWN & SHARPE #13 Spur Bevel Cutter

GEAR HOBBERS
BARBER COLMAN #12; single & double overarm; M.D.
GOULD & EBERHARDT #18-H Univ.; max. dia. 30"; M.D.
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late

GRINDERS—Plain Cyl. & Univ.
BROWN & SHARPE No. 1 Universal; late
BROWN & SHARPE No. 5 Plain; cap. 3x18"
LANDIS 6x18" Type C Plain; Hydr.; late
LANDIS 18x72" Type C Plain; M.D.
LANDIS 29"x130" centers Plain; M.D.
NORTON 10x72" type C Plain; Late
NORTON 17x42" centers crankpin; Hydr. Dble. hd.; M.D.

GRINDERS—Miscellaneous
BRYANT No. 8, 16-C-16, 16-CP-16, 24-36" Internal hydr.; Late
CINCINNATI No. 3 Centerless; M.D.
GLEASON No. 12 Tool Sharpener; late
HEALD No. 72-A-5 "Gagematic" Int.; Late
HEALD No. 72-A-3 "Gagematic" Int.; M.D.
LEMPCO 18x72" Mod. KG Crankshaft; Late
PRATT & WHITNEY type B 14x36" Hydr. Surface; Late
SHEFFIELD Micro-Form Grinder; late
THOMPSON 6x48" Auto. Rd. Broach; M.D.
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 639 Osc. type Radius; Late

LATHES ENGINE & MFG.
AMERICAN 24"x216" centers; geared; Timken; Late
AMERICAN 36"x360" centers; 2 carriages; M.D.
HARDINGE T.R.59 Bench type; Late
JONES & LAMSON "Fay" 24"x24"; 20x25" Auto.; Late
LEHMANN 25x96" center; TIMKEN; geared; M.D.
LeBLOND 22x48" centers; TIMKEN; late
LeBLOND 16x36" cent.; Auto.; Timken; late
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 24x120" centers; geared; Timken
LODGE & SHIPLEY No. 5—24" and 96" centers DUOMATIC; Timken; Late
LoSWING 4x60", 8x24", 8x108"; late
MONARCH 16x28" cent., geared head; M.D.
MONARCH 22x456", 3 carr. CM TIMKEN; M.D.
MONARCH 15x42" centers "Z" Magnamatic Auto.; TIMKEN; M.D.; Late
NILES 30"x11' centers "Time-Saver"; M.D.
NILES 30"x50' Boring "Time-Saver"; Timken; Late
NILES 48"x32' centers Engine; geared; M.D.
NILES 30"x46' Boring; single end; "Time-Saver; TIMKEN; M.D.; Late
REED PRENTICE 16"x24" centers geared; M.D.
SIDNEY 14"x66" centers spur geared; gap; NEW
SPRINGFIELD 14"x42", 16"x24" geared; M.D.

LATHES—RELIEVING
CLEVELAND 12"x16" centers Cutter Reliever; M.D.
US TOOL 810-B Cutter Reliever; Late

LATHES—TURRET
GISHOLT No. 3 Ram Type; TIMKEN; Late
GISHOLT No. 4, 5 Ram Type; TIMKEN
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CINCINNATI 4-48, 4 spindle, Tracer; Late
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GOULD & EBERHARD 25 Cont. type; M.D.
CINCINNATI No. 4 High Power; TIMKEN; Rect. M.D.
SUNDSTRAND No. 3 Rigidmill; TIMKEN

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INGERSOLL 32x24x16' Planer Type; 2 hds; M.D.
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
SUNDSTRAND Model 3A Duplex 42" feed
TAYLOR & FEN M-80 Duplex Spline; Late

MILLING MACHINES—Vertical
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CINCINNATI No. 28-60 Hydratel; tracer control; Late
SUNDSTRAND No. 3 Profile & Channel; Late
SUNDSTRAND Mod. 3A Rotary Rigidmill; M.D.

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PRATT & WHITNEY 4½x12 Mod. C; late
PRATT & WHITNEY 6x132; M.D.

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NILES-BEMENT-POND 72"x72"x30' 4 hds.; Rapid Traverse; M.D.
SELLERS 60"x30"x12' 4 heads vari-voltage dr.; PRT
WOODWARD & POWELL 54"x54"20'; 4 heads; M.D.

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BRIDGEPORT 48W Abrasaw wet cutoff; M.D.
ESPEN LUCAS No. 670-30" cap Hydr.; Late
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LYND FARQUHAR 26" Openside; M.D.
DILL 20-24" Vert. Slotter; M.D.
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CHAMBERSBURG Horiz. Straightening; 24" str.; M.D.
GLEASON 15", 25" Quenching; hydr.; M.D.
NIAGARA No. 512 DG tie rod; 282 tons; M.D.
UNITED ENG. 500 ton hydr. forging; 36" strk.

MISCELLANEOUS
ACME 2" forging, upsetting; late
AJAX 3½" forging, upsetting; M.D.
BAKEWELL No. 1, 1R Precision Tapper
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
DeLAVAL No. 194 Coolant Clarifier; Late
FISCHER No. 1, No. 2 Oil Groover; Late
FOSTER 4x36" centers; Superfinisher; Late
GROB OS-20 Metal Band Saw—Filer; M.D.
GROB NS-24 Band Saw; M.D.; Late
LANDIS 2" sgle. Dble. Spdle. Threaders; M.D.
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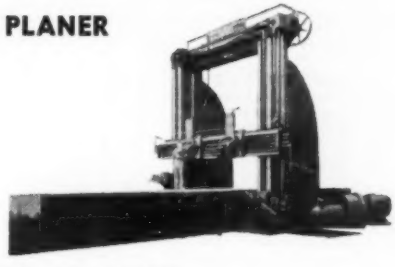

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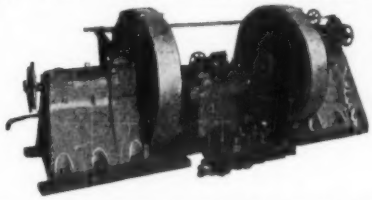

With: Calipering attachment; journal attachment; and quartering attachment

Arranged for chucking locomotive driving wheels.

Face plates with 3 Putnam non-slip driving dogs.

Capacity of lathe: 90".

Minimum and Maximum of engine for which quartering may be done 24" to 36".

Direct connected motor drive with 50 H.P., 7½ H.P., 3½ H.P., 230 volt D.C. motors and controls.

Approximate weight: 116,000 lbs.

No. 4FU FOSTER FASTERMATIC AUTOMATIC TURRET LATHE

Swing: Over bed 35½"; over cross slide 20".

Head: Spindle speeds 9 to 484 R.P.M.

Diameter hole through spindle 5⅛".

Timken bearing spindle.

Cross Slide: Width 10"; length 25".

Maximum cross travel 6".

Maximum distance spindle nose to turret face 59½".

Hardened ways.

Motor Drive: Motor drive w/20 H.P. motor and controls.

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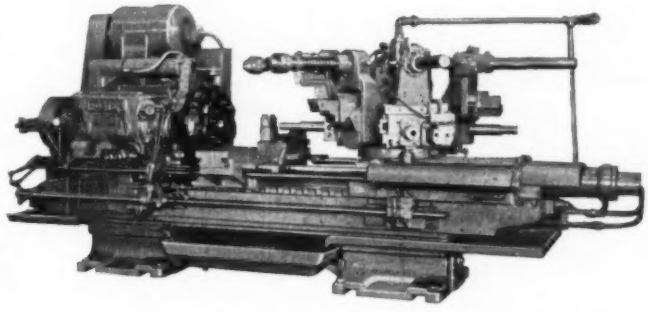

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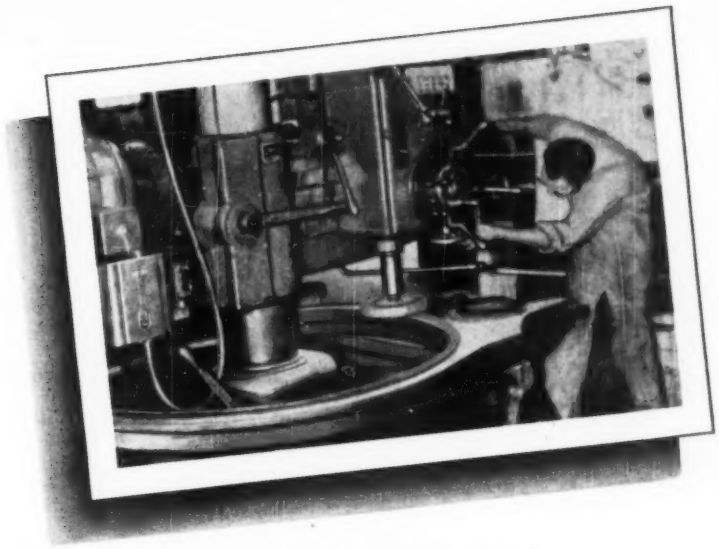

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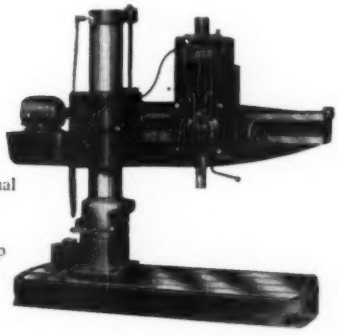

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